Siboga-Expeditie
XXXIa

THE

CIRRIPEDIA OF THE SIBOGA EXPEDITION

BY

P. P. C. HOEK

A. CIRRIPEDIA PEDUNCULATA

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VERZAMELD IN

NEDERLANDSCH OOST-INDIË 1899—1900

AAN BOORD **H. M. SIBOGA** ONDER COMMANDO VAN

Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
LEIDEN

A. CIRRIPEDIA PEDUNCULATA

Genus **Lepas** Linnaeus

Of the species forming this genus six were already known to DARWIN[1] (1851) and two only have been added since the appearance of the "Monograph": one *(Lepas testudinata)* by AURIVILLIUS[2] in 1892 and one *(Lepas denticulata)* by GRUVEL[3] in 1901.

Most of the species of this genus have "enormous ranges", as DARWIN (l. c.) remarked, yet the number of species hitherto observed with certainty in the East Indian Archipelago amounts to only four, viz.

Lepas anatifera Linn. Philippine Archipelago, according to DARWIN.
Lepas anserifera Linn. East Indian Archipelago (DARWIN); Java Sea, Moluccan Sea ("Challenger"); Sumatra, Ambon, Ternate etc. (WELTNER).
Lepas fascicularis Ellis & Solander. East Indian Archipelago, off Borneo and Celebes (DARWIN).
Lepas denticulata A. Gruvel. Honda Bay (Philippines).

(*Lepas Hilli* (Leach) which was collected by A. MENZIES in the "South Seas" and was found at Port Stephen, Australia (DARWIN), *Lepas pectinata* Spengler, which, according to DARWIN, is common under the tropics and *Lepas australis* Darwin, which DARWIN believed to be confined to the Southern Ocean, have not hitherto been observed in the East Indian Archipelago; nor has *Lepas testudinata* Aurivillius, known only from the neighbourhood of the Cape of Good Hope).

All the species of this genus live attached to floating objects and therefore seem to be inhabitants only of the surface-layers of the sea.

The specimens of the genus *Lepas* collected by H. M. S. "Siboga" belong to two species only: *L. anserifera* Linn. and *L. fascicularis* Ellis and Solander.

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[1] DARWIN, C., A monograph of the sub-class Cirripedia. The Lepadidae or Pedunculated Cirripedes. London, 1851.

[2] AURIVILLIUS, C. W., Neue Cirripeden aus dem Atlantischen, Indischen und Stillen Ocean. Öfversigt af K. Svensk. Vet. Akad. Förh. 1892, N° 3.

[3] GRUVEL, A., Étude d'une espèce nouvelle de Lépadides. Trans. Linn. Soc. (2), VIII, 5, 1901.

1. *Lepas anserifera* Linn.

This seems to be by far the commonest species in the part of the tropics explored by H. M. S. "Siboga"; it was not only collected at numerous places during the cruise, it was also several times found attached to the ship itself after being cleaned in the dock of Surabaja.

The places and stations where the species was taken are:

Stat. 19. Bay of Labuan Tring (Lombok), March 20, 1899. Fine set of specimens attached to a piece of wood. Surface. Another set of smaller specimens with a barbed carina attached to a piece of pumice-stone.

Lighthouse "De Bril" near Macassar. No date. Very small specimens attached to *Spirula*, the largest specimen has a capitulum of 6 mm. They belong to the var. *dilatata*: scuta broad, carina barbed.

Stat. 110. July 6, 1899. Lat. 4° 34′ N., Long. 122° E.; South of Sulu Archipelago. Surface. Two specimens; length of the capitulum of the larger, 25 mm.

Stat. 165. Daram Island (East Coast of Misool), August 22, 1899. Attached to a piece of gulf-weed. Small specimens of 6 mm. and smaller: var. *dilatata*. Associated with *L. fascicularis* Ellis & Solander.

Buton Strait, September 21, 1899. Surface, between Algae. Very small specimens attached to *Spirula*. Var. *dilatata* with barbed carina.

Stat. 214. October 27, 1899. Lat. 6° 30′ N., Long. 121° 55′ E. Surface, attached to *Spirula*. Very small specimens: var. *dilatata*.

Stat. 228. November 14, 1899. Lat. 4° 32′.5 S., Long. 128° 30′.5 E. Surface. Small specimens attached to a species of Fuci. [The largest specimen has a capitulum of 7,5 mm.].

No place, no date. Attached to the keel of H. M. S. "Siboga". One specimen. Length of the capitulum 20 mm.

July 10, 1899. Attached to the keel of H. M. S. "Siboga", 40 days after having been docked in Surabaja. Size of largest specimen: capitulum 21 mm. The larger individuals are furnished with ovigerous lamellae.

October 15, 1899. Attached to the keel of H. M. S. "Siboga", 107 days after the ship was cleaned in the dock of Surabaja. Several specimens; length of the capitulum of the largest individual, 25 mm.

Remarks. The specimens collected in the Bay of Labuan Tring (Lombok) caused me some difficulty as they differed from the usual appearance of *L. anserifera* in one of its most distinctive characters, viz. in the occludent margin of the scutum not being arched or protuberant. Further, the internal umbonal tooth of the right-hand scutum in these specimens is hardly stronger than that of the left-hand scutum. But as these characters vary even within the specimens of this locality, the form of the scutum in some of them approaching more to the typical form than is the case in others; there existing, moreover, a close resemblance in other regards between this and the typical form, no doubt was left as to the importance of this difference. Several specimens from this locality show the straight line of small quadrilateral depressions of a dirty brownish colour in the scutum, running diagonally across the capitulum, which are very common in *L. anatifera*. Darwin (l. c. p. 78) observed a trace of a diagonal line of such marks in a single specimen of *L. Hilli* — but they have not been observed before in *L. anserifera*, so far as I know.

2. *Lepas fascicularis* Ellis & Solander.

This species which is rather common in tropical seas was observed once only during the cruise of the "Siboga", viz. on Aug. 22, 1899 (Station 165), anchorage on north-east side of Daram Island (False Pisangs), East Coast of Misool.

There are medium-sized and small specimens; the larger ones have the capitulum 20 mm. long.

The valves stand at a certain distance from each other and have very distinctly brown-coloured margins. The shape of the carina nearly approaches that of the typical form; the lower part however does not expand in such a broad disc as figured by DARWIN.

Some of the specimens are attached to fuci associated with young specimens of *L. anserifera*; others form a group which is attached to a small brown ball of vegetable origin.

Genus **Poecilasma** Darwin

When proposing the new genus *Poecilasma*, DARWIN (1851) knew five species belonging to it; he thought it probable, however, that several more would be discovered later.

This prediction of DARWIN can be said to have been fully realised: I am not quite sure that all descriptions of new forms have become known to me, but certainly eleven new species have come to my notice up to date, viz.:

HOEK, Cirripedia "Challenger", 1883, ... 2 species.
AURIVILLIUS, Studien über Cirripedien, 1894, ... 4 species.
AURIVILLIUS, Cirripèdes "Princesse-Alice", 1898, . . . 1 species.
GRUVEL, Lépadides nouveaux British Museum, 1902, 1 species.
HOEK, Cirripedia "Siboga", 1907, ... 3 species.

Of some of these species it is questionable, whether they are really "good" species: for example, as *P. aurantium* Darwin is considered by GRUVEL[1] to be a variety of *P. Kaempferi*; I think also, that it is doubtful whether *P. amygdalum* Auriv. and *P. lenticula* Auriv. are really different from one another and from DARWIN's *P. fissum*. But even then 9 new forms would remain: a not unimportant increase to the number known to DARWIN.

The mutual affinities of the species of *Poecilasma* are not easily understood. *P. Kaempferi* Darwin (with *aurantium* Darwin), *P. dubium* n. sp., *P. carinatum* Hoek and *P. gracile* Hoek seem to form a natural group of true *Poecilasmas*, mainly differing from one another in the shape and size of the carina. The species with the scutum composed of two segments form a second apparently natural group: they are *P. fissum* Darwin (with *amygdalum* Auriv. and *lenticula* Auriv.), *P. excavatum* n. sp., *P. minutum* Gruvel, *P. tridens* Auriv. and *P. vagans* Aurivillius. Of these species *P. excavatum* n. sp. and *P. minutum* Gruvel may turn out to be much more nearly related than the others. The remaining species: *P. crassum* Gray (with *P. unguiculus* Auriv.), *P. obliquum* n. sp. *P. eburneum* Hinds might be considered to form a

[1] GRUVEL, A., Cirripèdes. Expéditions du Travailleur et du Talisman. Paris, 1902.

third natural group: the first with small, the second with rudimentary, the third without terga. For the sake of convenience, such a classification may be used; but studying a few of the species more carefully one soon discovers, that the affinities between the different species cannot be made out by the shape or size or the greater or less development of parts of the capitulum only. To show how complicated the relations are I need only refer to the new species *P. obliquum* found by the "Siboga" and to be described later. With its miniature terga it seems very naturally to bridge over the gap between *P. crassum* with small and *P. eburneum* without terga; yet the arrangement of the spines on the cirri in *P. obliquum* is quite different from what it is in *P. eburneum* and shows that it is perfectly impossible to consider them as nearly related. In this regard *P. obliquum* seems to be nearly allied to *P. fissum*; in the presence, however, of a distinct line running from the umbo to the upper end of the scutum *P. eburneum* approaches to *P. fissum* much more than *P. obliquum* does.

The geographical distribution of the species of *Poecilasma* is only imperfectly known as yet. Two species have been observed in the Atlantic and also in the Pacific; a very large proportion of the known species inhabit the Malay Archipelago, as may be seen from the following list:

Poecilasma Kaempferi Darwin (with *P. aurantium* Darwin), Japan, Madeira, 350 à 400 m. (GRUVEL), Gulf of Manaar, 775 m. (ANNANDALE).
Poecilasma dubium n. sp., Malay Archipelago, 204 to 304 m.
Poecilasma carinatum Hoek, West Indies, Atlantic, Malay Archipelago, 600 to 1633 m.
Poecilasma gracile Hoek, Australia, Malay Archipelago, 521—750 m.
Poecilasma fissum Darwin (with *P. amygdalum* Auriv. and *P. lenticula* Auriv.), Malay Archipelago, Philippines, Australia (WELTNER [1]), Andamans (ANNANDALE [2]). Low water.
Poecilasma excavatum n. sp., Malay Archipelago, 289—304 m.
Poecilasma minutum Gruvel?
Poecilasma tridens Auriv., Philippines. Depth?
Poecilasma vagans Auriv., probably East India. Pelagic?
Poecilasma crassum J. E. Gray, Madeira (DARWIN), Azores (GRUVEL). Depth?
Poecilasma unguiculus Auriv., Azores, 880 m.
Poecilasma obliquum n. sp., Malay Archipelago, 204—304 m.
Poecilasma eburneum Hinds, Malay Archipelago, ? Red Sea (WELTNER [3]), 40—90 m.

Poecilasma Kaempferi (with *P. aurantium*) and *P. carinatum* are so far as at present known the only species inhabiting both the Atlantic and the Indian Ocean. GRUVEL [4] says that *P. crassum* [from Madeira (DARWIN)] and the Azores occurs also in the Philippine Archipelago, Island of Bohol, but I suspect that this is an error; I do not know at any rate, on whose authority this is stated.

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[1] WELTNER, W., Cirripedien einer Reise nach dem Pacific. Zoolog. Jahrbücher. Abt. für Systematik, XII, 1899.
[2] ANNANDALE, N., Malaysian Barnacles in the Indian Museum. Memoirs of the Asiatic Society of Bengal, I, 5, 1905.
[3] WELTNER, W., Verzeichnis der bisher beschriebenen recenten Cirripedienarten. Archiv f. Naturgeschichte, 1897, Bd I, H. 3.
[4] GRUVEL, A., Monographie des Cirrhipèdes. Paris, 1905, p. 116.

The bathymetrical distribution is not known for all the species. *P. vagans* was found attached to a *Nautilus* and may be considered as a pelagic species, *P. fissum* lives on crabs, one of which was found under a stone at low water (DARWIN), another (a *Palinurus*-species) was thrown on the shore (AURIVILLIUS): it is, no doubt, a true littoral form. *P. eburneum* was taken by the "Siboga" at depths from 40—90 m. and seems to be a shallow-water form. *P. dubium*, *P. excavatum* and *P. obliquum* were found at depths varying from 200 to 300 m. *P. Kaempferi*, *P. carinatum*, *P. gracile* and *P. unguiculus* go down to 500—900 m., *P. carinatum* being the only one taken at so great a depth as 1633 m.

1. *Poecilasma carinatum* Hoek. Pl. I, fig. 1.

1883. HOEK, Cirripedia of the Challenger. p. 44, pl. I, fig. 8—10; pl. II, fig. 1; pl. VII, fig. 6—7.

This species was taken during the cruise of the "Siboga" at

Stat. 177. Sept. 1, 1899. Lat. 2° 24'.5 S., Long. 129° 38'.5 E. Depth, 1633 m. Bottom: dead coral and stones, covered with manganese. (About half-way between Misool and Ceram).

and at

Stat. 284. January 18, 1900. Lat. 8° 43'.1 S., Long. 127° 16'.7 E. Depth, 828 m. Bottom: grey mud. Attached to a small stem of *Chrysogorgia flexilis* (Wr. & St.). One specimen.

Only one group of 3 specimens and one single specimen were taken. As my figure of this species reproduced on Pl. I of the Report on the "Challenger" Cirripedia is not quite satisfactory, I have made a new drawing from the group of specimens collected by the "Siboga" at Station 177.

This species affords a striking example of the world-wide distribution of some deep-sea species; whereas the "Challenger" collected it off Culebra Island (West Indies) at a depth of 713 m. and off Ascension Island (Atlantic Ocean) at a depth of 768 m. it was taken by the "Siboga" in the East Indian Archipelago at a depth of more than 1600 m. and again at a depth of 828 m. According to GRUVEL[1] it is also found at the coast of Cuba at depths varying between 600 and 900 m.

2. *Poecilasma gracile* Hoek.

1883. HOEK, Cirripedia of the Challenger. p. 46, pl. II, fig. 2—4.

This species was collected by the "Siboga" at

Stat. 38. April 1, 1899. Lat. 7° 35'.4 S., Long. 117° 28'.6 E. Depth 521 m. Bottom: coral. (North of Sumbawa).

The "Challenger" took one specimen off Sydney (Australia) at a somewhat greater depth, viz. 750 m. In the collection of the "Siboga" it is represented by three specimens. Two of them are attached to the spine of an echinid, the third to a much thinner spine — perhaps of an echinid also. The largest specimen measures with the peduncle 11,5 mm., the capitulum alone having a length of 9 mm. The specimen collected by the "Challenger" was smaller, viz. 8 mm. entire length, its capitulum measuring nearly 7 mm.

[1] GRUVEL, A., Monographie des Cirrhipèdes. Paris, 1905, p. 115.

3. *Poecilasma dubium* n. sp. Pl. I, fig. 2—4; Pl. X, fig. 1*a*—1*d*.

Capitulum distinctly swollen about the middle, compressed towards the apex. Scuta oval, basal margin short. Terga with the basal point obliquely truncated. Carina narrow, its keel flattened near the inferior extremity. Basis of the carina truncated, indistinctly forked. Peduncle $^1/_3$ the length of the capitulum. No thicker spines in the notch of the maxillae under the three upper stronger spines.

General appearance (Pl. I, fig. 2). Much like *P. Kaempferi* Darwin but with a shorter peduncle and a somewhat different carina. Valves quite white, the scutum distinctly striated.

Scutum distinctly striated. Apex pointed, a distinct ridge runs from the apex to the umbo, the part between this ridge and the occludent margin being broader than in *P. Kaempferi*. Basal margin and carinal margin together forming an almost continuous curved line. Interiorly the basal margin is furnished with a strong rim and a tooth at the occludent, basal corner.

Tergum small in proportion to the scutum with the basal end obliquely truncated, apex pointed. Delicately striated.

Carina (Pl. I, fig. 3) extremely narrow, its width only slightly increasing towards the base. Its base truncated, miniature excrescences at both sides representing the prongs of the fork of other species (Pl. I, fig. 3*a*).

Peduncle cylindrical, short, less than one third the length of the capitulum, distinctly ringed.

Size. The largest specimen has a capitulum of 10,5 mm. length.

Mouth: Labrum with about 28 small bead-like teeth placed at a little distance from one another; Palpi with rather numerous, slender, not very long hairs.

Mandibles with four teeth and the inferior angle bifid; most of the hairs on the surface are placed in little groups of two or three together.

Maxillae (Pl. I, fig. 4) with three stronger spines above the notch, a very short spine near the third of these three at the beginning of the notch, no spines in the notch and four short and slender ones at the other slope of the notch; a number of about 12 stronger as well as smaller spines on the inferior, upraised part. Hairs on the surface of the maxilla not very dense, in groups of two or three.

Outer maxillae almost quadrangular, with the outer edge rounded; the surface and the outer margin with numerous hairs, those of the margin curved for the most part.

Cirri. First pair standing far from the second, with nearly equal rami: the one divided in six, the other in seven segments, the first segment of both being indistinctly divided into two. Surface of each segment with a dense tuft of long hairs.

Second cirrus about three times as long as the first; the longest (posterior) ramus has 13, the anterior ramus 11 segments.

Third cirrus with rami of 15 and 14 segments. Most segments are furnished on the inner side with four pairs of spines: the first and the second pair very long, the third shorter, the fourth very short and delicate, nearly rudimentary; sometimes a fifth pair of extremely delicate hairs is present; as a rule a slender spine is implanted between the two of each pair.

The cirri of the fourth-sixth pairs have about the same structure. The sixth cirrus has rami of 18 segments; each segment bears four pairs of spines as on the third cirrus.

Caudal appendages extremely short with a tuft of hairs at the extremity.

Penis rather thick, slightly swollen at the extremity, where it bears a dense tuft of hairs.

H. M. S. "Siboga" collected this species on two different occasions:

Stat. 251. December 8, 1899. Lat. 5° 28'.4 S., Long. 132° 0'.2 E. Depth 204 m. Bottom: hard coral sand. Two specimens and four with abnormal capitula.

Stat. 253. December 10, 1899. Lat. 5° 48'.2 S., Long. 132° 13' E. Depth 304 m. Bottom: gray clay, hard and crumbly. Four specimens.

General Remark. This species comes near to *P. Kaempferi* Darwin in some regards, in others it seems to approach *P. aurantium* Darwin. GRUVEL who investigated numerous specimens of *P. Kaempferi* from Cape Bojador thinks that *P. aurantium* is a variety of *P. Kaempferi*. He gave a new figure of this form — it leaves no doubt, I think, that the specimens collected by the "Siboga" are really distinct from it. But the three forms: *Kaempferi*, *aurantium* and *dubium* are certainly nearly related and belong to one and the same group of species.

Observation. The capitulum of four of the specimens collected at Station 251 is more or less abnormal. They are small specimens and differ considerably from one another. From the figures 1, *a*—*d*, of Pl. X these differences may be judged.

Fig. 1*a* represents the least abnormal one. It is a small specimen, the greatest diameter of the capitulum measuring 5 mm., the whole animal 6,5 mm. only. It is slightly more swollen transversely than the normal specimens, the occludent margin of the scutum being more strongly convex. The principal difference, however, is in the tergum being distinctly divided into two parts by a line running nearly parallel with the scutal margin.

Fig. 1*b* gives the next stage of abnormality. The specimen has about the same size as the foregoing: capitulum 5 mm., total length 6 mm. The division of the tergum into two pieces is in this specimen more pronounced, the superior part being rounded off and overlapping the inferior, especially towards the occludent side of the valve. In this specimen, moreover, the carina is broken up into three parts: the largest being the inferior one, two smaller, narrower parts lying between the inferior piece and the obliquely truncated basal end of the tergum.

Fig. 1*c* represents a still more advanced stage of abnormality. The original shape of the tergum is quite lost, an elongate oval, calcareous plate occupying its place, the apical part of which reaches relatively far beyond the occludent margin of the capitulum. The superior part of the carina is divided into different little pieces of shell, one lying immediately between the carina and the abnormal tergum, of which it might be difficult to say whether it belongs to the carina or the tergum. The shape of the capitulum of this specimen is broader, the occludent margin of the scutum still more strongly convex than in the other specimens. The part of the capitulum occupied by the scutum is considerably larger in consequence. The size of this specimen, i. e. the length of the whole animal was 5,5 mm., 4,75 being the length of the capitulum.

Fig. 1*d* was drawn from the largest of the four specimens; it differs from the normal form in other regards than the foregoing ones. In this specimen the whole shape of the capitulum is

so different, that I would hardly have taken the animal for an abnormal *P. dubium*, if I had received it from a quite different Station. Comparing the different valves with those of a normal *P. dubium*, the tergum in the first place is larger, its apex is slightly recurved and its basal angle is not truncated but rounded. In the second place, the scutum is broader and its tergal margin is much longer than in the typical specimens. Finally, the carina is not simply and regularly bowed, but its upper part is recurved, and there is further a small isolated piece of valve, which I think belongs to the carina, and which is placed between the tip of the remaining part of that valve and the inferior angle of the tergum. In this specimen, moreover, the peduncle is longer than in the other specimens, its length being about $^2/_5$ of the length of the capitulum. The total length of this specimen was 7,2 mm., that of its capitulum about 5 mm.

I do not know what circumstances or causes made these four specimens develop in such an abormal way. They were most probably dead, when they were taken by the "Siboga". I conclude this in the first place from the fact that the animals were hanging out of the capitulum in a more or less deteriorated condition, in the second place from the circumstance that numerous stalked Infusoriae are attached to the surface of the capitulum in all. As DARWIN already observed more than half a century ago, there is often very considerable variation in the exact shape of the valves, more especially of the terga (l. c. p. 29). In the present instance it is, however, not so much variation in shape as that in three of the four specimens, at least, there is abnormality in the process of calcification or shell-building. Under *P. excavatum* I describe another case of such abnormality — without trying to explain its origin. This will be the task of future investigators who study these animals in the fresh condition and at the place where they occur.

4. *Poecilasma fissum* Darwin. Pl. X, fig. 2—5.

Poecilasma fissa Darwin. Monograph, Lepadidae, 1851, p. 109, pl. II, fig. 4.

DARWIN founded this species for a single specimen of *Poecilasma* which he took from a spinose crab found under a stone at low water in the Island of Bohol, Philippine Archipelago.

Numerous specimens were taken from a *Palinurus*, collected at Ternate during the cruise of H. M. S. "Siboga". There are about six larger and about fifty smaller specimens. The larger ones measure about 8 mm., 4,5 to 5 mm. coming on the capitulum, 3,5 to 3 on the peduncle.

DARWIN says that the capitulum of his specimen was nearly a quarter of an inch long and that its shape was gibbous, broadly oval. The description he gives of the capitulum, the valves etc. applies so well to the specimens from Ternate that there remained for me no doubt as to these specimens really belonging to DARWIN's *Poecilasma fissa*. There are little differences, however, in the structure of the parts of the mouth, the cirri etc. DARWIN's description was founded on a single specimen which moreover "had long been kept dry" and little differences may occur within the limits of a species. I would hardly insist on these differences, had they not caused what I suppose to be the same species to be described by AURIVILLIUS as a new one under the name of *P. amygdalum*[1]. For this reason especially, the following details of the animals structure may be of interest.

[1] AURIVILLIUS, C. W., Studien über Cirripedien. K. Svensk. Vetensk.-Akad. Handl. XXVI, N° 7, 1894, p. 10.

Labrum with a row of about 24 small teeth, standing close together; at each side the 5 or six outer ones are sharply pointed, the dozen in the middle being rather blunt. Palpi small, conical, with about five longer hairs at the tip and a few smaller ones along its inner side.

According to DARWIN the fourth tooth of the mandible is pectinated. I found a small tooth on the inner edges of the second and third teeth, one on the outer edge of the fourth tooth and also one on the edge of the inferior angle.

The maxillae were unknown to DARWIN. The upper part (Pl. X, fig. 2 and 2*a*) is furnished with three spines: two claw-like and the third rather straight and more delicate; of the two claw-like spines the first is one and a half times as broad and long as the second. Under the upper part there is a deep notch, on the inferior margin of which two minute hairs are planted. The inferior part of the edge of the maxilla is much produced and bears about ten unequally stout spines. Of these the one placed about the middle is by far the strongest.

The second maxilla (Pl. X, fig. 3) has the outline not truncated, but rounded; hairs over the inner surface of unequal length, rather delicate and not very numerous. Near the outer margin the surface shows, moreover, numerous rounded spots of peculiar aspect, which I have not observed in other species, so far as I can remember.

Cirri of the first pair were lost in DARWIN's specimen. They have unequal rami of respectively 6 and 9 segments. These segments are broad, short, quadrangular, bearing at the extremity a transverse row of numerous spines, which are longer than the segments themselves.

Cirri of the second to sixth pair much as described by DARWIN. Concerning those of the 6th pair the following may be pointed out: they have rather short pedicels and also short rami of 11 and 12 segments. Their lower segments are as long as broad, the more distal grow slightly longer, to about twice as long as broad, being slightly broader at the distal extremity; the terminal segments of both rami are short and narrow. The spines form two groups or tufts near the extremity of each segment (Pl. X, fig. 4): a dorsal and an anterior tuft, all of them arranged in a transverse line. DARWIN says that they are arranged in a circle, interrupted widely on the two sides and, of course, it may be expressed in that way. But what is especially characteristic for this species is, that the pairs of spines which as a rule in other Cirripeds are seen at the anterior faces of the segments of the cirri are totally wanting.

Caudal appendages (Pl. X, fig. 5) elongate, slightly broader in the middle, narrow at the extremity, where they bear a tuft of long slender hairs, like a kind of pencil. They reach to about the middle of the second segment of the pedicel of the 6th cirrus.

Penis long, pointed at the extremity, where it bears a tuft of delicate hairs.

General Remark. AURIVILLIUS (l. c. p. 12) points out himself that there is a close affinity between his new species *(P. amygdalum)* and DARWIN's *P. fissum*. Yet he thinks they are different, and to prove it he lays particular stress on the general form of the capitulum — more oval, with a broader basis in *P. fissum*, more elliptical with a narrow basis in his *P. amygdalum*. As I have said already, DARWIN used for his description a specimen which had long been kept dry and further, to judge from the material collected by the "Siboga", individual differences occur in this species with regard to the shape of the capitulum. One might consider some of the Ternate specimens as approaching more to AURIVILLIUS' and others more to DARWIN's

form. That the very peculiar arrangement of the spines on the cirri, which DARWIN called most abnormal, occurs in AURIVILLIUS' *nova species* also ("die eigentümliche Anordnung der Cirrenbörstchen des *P. fissum* findet sich bei dieser Art wieder"), is by all means a circumstance strongly in favour of my view that they are really one and the same species.

AURIVILLIUS took still another species of *Poecilasma* from the same specimen of *Palinurus*, thrown on the shore of the Island "Noordwachter", one of the "Duizendeilanden" in the Java Sea. He emphasizes that the main difference between this species and *P. amygdalum* is in the structure of the cirri; these show according to him quite different characters, especially with regard to the arrangement of the spines. In this second new species *(P. lenticula)* from *Palinurus*, the cirri bear two long spines on the anterior face and also two short ones distally from the middle of each segment; on the dorsal face, spines are only seen in the sutures. AURIVILLIUS gives a figure (l. c. Taf. VIII, fig. 28) to illustrate this detail of his *P. lenticula* — but this figure shows only spines in the sutures, on the anterior as well as on the dorsal side! Some confusion either in the figures or in the descriptions given by AURIVILLIUS must have taken place — but as he points out that the difference in the arrangement of the spines is the most essential, one cannot help thinking that after all the reason for separating two forms of *Poecilasma* as different species, which closely resemble one another in other regards and live together on the carapace of the same specimen of *Palinurus*, is not a very strong one.

According to DARWIN *Poecilasma fissum* occurs at the Philippines; according to WELTNER [1] it has been collected by FISCHER at New Caledonia, by WHITELEGGE at Port Jackson, by himself at Jaluit (on *Palinurus*) and by SCHAUINSLAND at Honolulu.

The label accompanying the "Siboga" specimens only says that they were found on a *Palinurus* at Ternate.

5. *Poecilasma excavatum* n. sp. Pl. I, fig. 5—10.

Capitulum with seven valves, the scutum being divided into two segments by a fissure nearly parallel to the occludent margin. Tergum with an excavation in the scutal margin near the occludent margin to receive the tip of the occludent segment of the scutum. Carina narrow, keeled near the inferior extremity, terminating in a disc.

General appearance. Capitulum oval, less than twice as long as broad, with the apex pointed, rather thick, swollen. Valves united without chitinous interspaces, peduncle cylindrical, narrow where it is attached to the capitulum (Pl. I, fig. 5).

Scutum. The larger segment strongly bowed, with a short basal margin and pointed apex. There is a trace of an internal basal rim, but no tooth at the rostral angle is present. Like the other valves the scutum is very delicately striated. The smaller segment is also distinctly bowed, it terminates in a point at the base and has the tergal margin rounded so as to fit exactly into the excavation of the tergum.

Tergum triangular with a very characteristic excavation at the scutal margin near the occludent margin (Pl. I, fig. 6).

[1] WELTNER, W., Ergebnisse einer Reise nach dem Pacific (SCHAUINSLAND 1896—97). Cirripedien. Zoologische Jahrbücher. Abteil. für Systematik u. s. w. II, 1899, p. 441—447.

Carina narrow, broader at the lower part which is distinctly carinated, terminating in a spatula-shaped disc which is embedded between capitulum and peduncle (Pl. I, fig. 7 and 7*a*).

Peduncle short, about half the length of the capitulum, cylindrical; narrow near the place of its attachment to the capitulum, swollen about the middle of its length. Surface with narrow rings indicated by darker chitinous transverse rings.

Size. The capitulum of the largest specimen collected was 11,6 mm. in length. The other specimens are however considerably smaller.

The study of the animal contained within the capitulum has yielded the following results:

Mouth. In general as in the other species of the genus, for example, as in *P. dubium*. Mandibles with a relatively greater distance between the first and second teeth, second, third and fourth nearer to one another on the other hand. Maxillae with no larger spines in the notch beneath the three great upper spines, with five or six slender spines on the slope at the other side of the notch. The spines on the inferior upraised part of the maxilla slightly smaller and less numerous (about 10) than in *P. dubium*.

Cirri. First pair at a distance from the second, with nearly equal rami each divided into five segments. Outer surface of the segments with numerous and long hairs, a transverse row of rather strong hairs or spines near the end of the third and fourth segments and terminally on the fifth segment also.

The other cirri as in the other species of the genus. The number of spines on the front side of the segments of the cirri N^0 II—VI is as a rule four pairs, a fifth pair being often indicated by a couple of extremely short hairs. The number of spines on the last segments is smaller. The number of the segments in the cirri II—III is 10 and 11, in the cirri IV—VI 11 and 12.

The caudal appendages are slender, about as long as the first segment of the pedicel of the sixth cirrus. They bear a dense tuft of very long hairs along the outer side in the last third part of their length (Pl. I, fig. 8).

Penis thick, ringed especially about the middle of its length, terminating in a much narrower and curved part. Extremely delicate and sparse hairs on the surface, a tuft of slightly stronger hairs at the extremity.

H. M. S. "Siboga" collected this species twice, viz. once five specimens at:

Stat. 253. December 10, 1899. Lat. 5°48.2 S., Long. 132°13′ E. Depth 304 m. Bottom: gray clay, hard and crumbly.

and half a dozen specimens at:

Stat. 12. March 14, 1899. Lat. 7°15′ S., Long. 115°15′.6 E. Depth 289 m. Bottom: coarse sand with broken shells.

Of the latter specimens one was attached to a small piece of the scale of a Crustacean.

General Remark. This species belongs to the same section of the genus as Darwin's *P. fissum* and the species *P. amygdalum*, *P. lenticula*, *tridens* and *vagans* of Aurivillius: all species with 7 valves, the scutum in each being formed of two closely approximate segments. The very characteristic excavation of the scutal margin of the tergum and the spatula-shaped

basal end of the carina render it easy enough to distinguish this species from those it shows affinity to in other regards.

Together with *Poecilasma excavatum*, *P. dubium* and *P. obliquum*, a form of *Poecilasma* was collected, about the nature of which I dare not pronounce an opinion with certainty. This form is represented by a single specimen. The length of its capitulum is 7 mm., the peduncle is about as long as the capitulum, cylindrical, distinctly ringed. It has the scutum divided into two segments and, what has never been observed in any species of this genus, the tergum also divided in two segments. The fissure runs in continuation to the fissure of the scutum and has the same character in the terga of both sides. The terga do not look quite normal, however, as they are only partly calcified: a relatively large part of the surface of the tergum being occupied by chitinous substance.

In fig. 9, Pl. I I give a drawing of the outlines of this curious form, magnified slightly over 5 diameters; in fig. 10 the apex of the scutum is represented with the division of the tergum magnified 36 diameters. I feel at a loss to decide whether this form is normal, in which case it would represent a very interesting section of the genus *Poecilasma*, or what seems more probable provisionally, a pathological abnormality being caused by mutilation and regeneration of the parts that have been broken off. . . .

N.B. This form has been labelled *P. excavatum*, varietas.

At the same Station (253) still another form of *Poecilasma* was collected. It is represented by a single specimen only; like *P. fissum*, *P. excavatum* etc. it has the capitulum composed of seven valves and it is also nearly related to these species in other regards. Its peduncle seems to be broken off, but the surface of the part remaining bears numerous microscopic spines. The smaller segment of the scutum terminates at its tergal extremity in a point, so that no real tergal margin is formed: in this regard this form resembles *P. fissum* more than *P. excavatum*. It differs from both species in the smallness of its terga, its carina being a little longer than in these species.

The length of the capitulum of this form is 5 mm., that of the part of the peduncle found attached to the capitulum about 2 mm. It was collected at a depth of 304 m. As the specimen does not seem to be quite complete I think it better not to introduce it into the system under a specific name.

6. *Poecilasma obliquum* n. sp. Pl. I, fig. 11—22.

Capitulum slightly unsymmetrical, tergum rudimentary and concealed in the membrane between the two scuta; carina with a prominent heel, terminating in a small imbedded fork. Cirri short, partly rudimentary.

General appearance (Pl. I, fig. 11 and 12). Capitulum of oblique lenticular shape, placed in such a way to the peduncle, that its base is covered at the right side more than at the left. Scuta in the larger specimens distinctly furrowed.

Scutum. Seen externally the basal margin can hardly be separated from the carinal margin, but an internal basal rim shows how far the basal margin extends (Pl. I, fig. 13). Occludent margin curved, near the basal angle slightly turned inward. A triangular tooth is placed internally near the basal angle. The occludent margin meets the tergal margin almost without forming an upper angle. Carinal and tergal margins blend into one another quite gradually. The two valves, of right and left side, are equally convex. Seen externally the surface of the scutum in the larger specimens is not smooth but furnished with a very distinct series of furrows parallel to the carino-tergal margin.

Tergum (Pl. I, fig. 13 and 14). Quite rudimentary, triangular. The basal angle is not pointed but obliquely truncated.

Carina (fig. 15*a* and 15*b*). Little over half as long as the carinal margin of the scutum, narrow and internally convex. The exterior surface is carinated and has a prominent heel, in front of which the little fork which is imbedded between the capitulum and the peduncle is attached.

Peduncle cylindrical, narrow and extremely short, in the largest specimen covered at the right side for a great part by the overhanging scutum.

Size. The largest specimen has a capitulum of 7 mm., the whole length being slightly over 7,5 mm.

Mouth. Labrum (fig. 16 and 16*a*) bullate, the front part overhanging and triangular. Crest hairy and pectinated, i. e. furnished with a row of smaller and larger, sharp triangular teeth placed close together. Palpi small, triangular, hairs neither very numerous nor very long. Mandibles (fig. 17) with four teeth and a rudimentary inferior angle, produced into a fine point. The teeth are nearly equidistant, tooth 1, 2 and 3 finely pectinated on the inferior side. Mandibles on the front part more densely hairy than in the other species of the genus. Maxillae (fig. 18) with a notch beneath the three upper spines, hairs in the notch delicate; the not very numerous (6—8) spines beneath the notch relatively delicate also; covered with dense hairs. Outer maxillae (Pl. I, fig. 19) quadrangular, rounded at the corners, hairs not very dense nor very long.

Cirri, short, very unequal, more or less rudimentary. The cirri of the right side as a rule smaller than those of the left side. The first pair is not far from the second pair. Both cirri of the first pair have unequal rami, but each ramus is composed of 7 segments. The 1st cirrus of the right side has the shorter ramus about half as long as the longer, in that of the left side the difference is not so great. Each segment bears a transverse row of strong spines at the extremity and these grow stronger and become more numerous distally. The top of the last segment bears five or six spines. The concave side of each ramus has a group of spines at the extremity of each segment, the convex side is furnished with a row of very delicate hairs.

The second cirrus of the right side has unequal rami both composed of eight segments; that of the left side has the posterior longer ramus composed of 10, the anterior ramus of 8 segments. The segments are, as in the first cirrus, short, quadrangular or even broader than long. Each segment has a transverse row of spines at the outer side near the extremity, more strongly developed in the terminal segments and towards the dorsal side of each ramus.

The inner side of each segment has a transverse row of more delicate spines or hairs and these form tufts of hairs at the concave side, especially of the lower segments.

Third cirrus of the right side with both rami much shorter than those of the left side. The rami of the third cirrus of the left side have 11 and 9 segments; form of the segments and distribution of the spines much like in the second cirrus.

Fourth cirrus of the right side quite rudimentary, rami very unequal, both composed of five segments, with small groups of hairs at the extremity of the segments. On the left side the cirrus is composed of two nearly equal rami composed of 11 segments. The fourth left cirrus has the same structure as the left one of the fifth pair (Pl. I, fig. 20): the groups of spines on the dorsal side of the rami at the extremity of the segments and growing stronger in the terminal segments are very characteristic for both cirri.

The right-hand cirrus of the fifth pair is extremely small, rudimentary (Pl. I, fig. 21). It differs from that of the fourth pair in having quite equal rami. They are composed of five segments.

Both cirri of the sixth pair have a stronger ramus of 12 broader segments and a more slender ramus of 11 segments. They bear, at the extremity of the segments towards the dorsal side, the same groups of stronger spines as in the left-hand cirrus of the 4th and 5th pair; at the anterior or concave side, each segment bears as a rule one pair of spines or a larger spine accompanied by two or three more slender ones.

Caudal appendages (Pl. I, fig. 22) shorter than the first segment of the pedicel of the sixth cirrus, slender with a dense tuft of hairs near the extremity and a few hairs along the sides.

Penis cylindrical, growing thinner towards the extremity, with very numerous and very delicate curved hairs scattered over its surface; a tuft of such hairs at the extremity.

Eggs numerous, long oval. Longest axis 0,2 to 0,22 mm., shortest axis 0,08 mm.

This species was taken in half a dozen specimens, only two of which seem to be full-grown, at:

Stat. 253. December 10, 1899. Lat. 5°48′.2 S., Long. 132°13′ E. Depth 304 m. Bottom: gray clay, hard and crumbly.

Stat. 251. December 8, 1899. Lat. 5°28′.4 S., Long. 132°0′.2 E. Depth 204 m. Bottom: hard coral sand. One small specimen.

General Remark. This is a very remarkable species. Were it not for Darwin's (Hinds') *P. eburneum*, I would have felt greatly inclined to consider it as representing a new genus. As already observed by Hinds (who therefore proposed the name *Trilasmis* for this Cirriped) and as described in detail by Darwin, the terga are "entirely" absent in *P. eburneum* and at first I did not find them in *P. obliquum* either. Yet on studying the capitulum more carefully, I discovered the terga as extremely minute triangular pieces, hidden in the folds of the membrane uniting the two scuta over the upper end of the carina. In this regard the new species *obliquum* with its quite rudimentary terga bridges the cleft which separates *P. crassum* with small (Darwin says "rudimentary" terga — but they are well-developed and even large in comparison with those of *P. obliquum*) terga and *P. eburneum* with no terga whatever. The structure of the parts composing the mouth in *P. obliquum* differs in several regards

from what it is in other species of the genus, yet these differences are perhaps not so great as they give one the impression of being at first sight. In *P. obliquum* the teeth of the labrum are triangular, approximated and of unequal size, whereas in the other species of the genus they are bead-like and removed from one another. In *P. eburneum*, however, I found the teeth on the lateral parts of the labrum sharply pointed, triangular, and in *P. fissum* the same is the case. In *P. obliquum* the first-third teeth of the mandibles are finely pectinated; traces of such a pectination are, however, observed in *P. fissum* also. In *P. obliquum* the somewhat rudimentary cirri have short quadrangular segments and transverse rows of spines, the pairs on the anterior faces being represented by a single pair only. In this regard this species comes nearest to *P. fissum* — the difference being that the spines in the latter species consist of two tufts, an anterior and a dorsal, whereas they form a more continuous row on the cirri of *P. obliquum*.

So far as the shape and structure of the valves are concerned, *P. eburneum* of known species of *Poecilasma* is the nearest relative of *P. obliquum*; with regard to the structure of the body *P. fissum* has no doubt greater affinity to *P. obliquum* than any of the other species.

7. *Poecilasma eburneum* (Hinds). Pl. X, Fig. 6—7.

Trilasmis eburnea Hinds, Voyage of Sulphur. I. Mollusca, 1844, Pl. XXI, fig. 5.
Poecilasma eburnea (Hinds), Darwin, Monograph, Lepadidae, 1851, p. 112, pl. II, fig. 5.

H. M. S. "Siboga" collected specimens of this interesting species on several occasions.

DARWIN's descriptions of the species of Cirripedia are as a rule so good that hardly anything need be added. Having made acquaintance with the curious species *P. obliquum* and having discovered its miniature terga, I was anxious, however, to investigate HINDS species a-new and to compare its structure with that of my new species.

With regard to the capitulum I found DARWIN's description exact: the terga are entirely wanting, the shape of the scuta and carina, the way in which the capitulum is placed with respect to the peduncle etc. are entirely as DARWIN has them. As to the structure of the parts of the mouth, the cirri etc. little differences, however, were found and a few observations may therefore be permitted here.

The labrum has small teeth along its crest, those in the middle are bead-like; at each side, however, half a dozen are sharply pointed and slightly distant from one another. The hairs on the tip of the palpi are rather long, so long as to touch when the two palpi are turned towards one another. The inferior angle of the mandible is spine-like, the side directed towards the fourth tooth bears an extremely minute tooth near the extremity — whence the angle is bifid, as DARWIN says. Maxillae with two larger and a third somewhat smaller upper spine, a couple of rather delicate and short spines at each side of the main notch; the inferior upraised part is not straight, but forms steps, the excavations being indicated by DARWIN as minute notches. Second maxillae (Pl. X, fig. 6) truncated, broad, nearly quadrangular with rounded corners; hairs at the tip and along the inner surface rather numerous and not very long.

With regard to the structure of the cirri the main difference between DARWIN's description and what I have found is, that I think the unequality of the rami almost unimportant, and further, that the segments of the rami of the 2nd and 3rd cirri are distinctly protuberant. Altogether the cirri are short, the segments of the rami being but little longer than broad and not very numerous; the last pair has rami of 13 and 14 segments in one of the specimens I investigated. These segments have the ordinary 3 or 4 pairs of spines on the anterior face, but as the segments are rather short these pairs stand close together and form groups of spines, a "brush" as DARWIN says, with the more or less numerous lateral marginal spines. The dorsal side of each segment bears the ordinary dorsal tuft near the extremity (Pl. X, fig. 7).

The caudal appendages are short, less than half the length of the lower segment of the pedicel of the sixth cirrus; they are slightly swollen about the middle, the rounded extremity being distinctly narrower. The distal third part is thickly clothed with delicate bristles, standing out in all directions.

During the cruise of the "Siboga" this species was collected at:

About Stat. 51: in Street Molo. Depth 54—90 m. 1 small specimen.
Stat. 79. June 12, 1899. Lat. 2°43′ S., Long. 117°44′ E. Depth 41—54 m. Bottom: fine coral sand [Borneo Bank]. Attached to the spines of a *Cidaris bispinosa* Lam. 8 specimens, most of them small, three larger. The greatest diameter of the largest is about 7 mm.
Stat. 79a. June 12, 1899. Lat. 2°38′.5 S., Long. 117°46′ E. Depth 54 m. Bottom: fine coral sand [Borneo Bank: 5 miles N.N.E. from Station 79]. 4 specimens, greatest diameter of largest 7 mm.
Stat. 80. June 13, 1899. Lat. 2°25′ S., Long. 117°43′ E. Depth 40—50 m. Bottom: fine coral-sand. 4 specimens, largest not quite 5 mm.

General Remark. This species, which was known to DARWIN from specimens from New Guinea only, may now be considered to occur at different places in the Malay Archipelago. It lives attached to the spines of *Echinus*, *Cidaris* and perhaps other forms of Echinidae and seems to go down to depths of over 50 m. According to WELTNER[1] the Berlin Museum possesses specimens of this species collected in the Red Sea (by LEPSIUS?).

Genus **Dichelaspis** Darwin

DARWIN (1851) instituted the genus *Dichelaspis* for those Lepadidae which have 5 valves, generally appearing like 7 from each scutum being divided into two distinct segments united at the rostral angle; he distinguished five species of the genus. When my report on the "Challenger" Cirripedia was published (1883) the number of known species had increased to nine. Since that time the number has increased considerably; WELTNER, publishing a list in 1897[2] of the then known species of Cirripedia, was able to count 18 species, or even 19, as by a slight omission one of the 8 new species introduced into science by AURIVILLIUS[3] was left out by WELTNER. WELTNER also mentioned two new species which STEBBING[4] described in 1894;

[1] WELTNER, W., Verzeichnis etc. Archiv f. Naturg. 1897, Bd I, H. 3, p. 243.
[2] WELTNER, W., Ibidem, p. 241.
[3] AURIVILLIUS, C. W., Studien etc. 1894, p. 15—28.
[4] STEBBING, T. R. R., Notes on Crustacea. Ann. & Mag. Nat. Hist. (6) XV, 1894, p. 18—19.

but, of course, five other new species the descriptions of which have been published in 1900 by GRUVEL [1], two described by LANCHESTER [2] in 1902 and one by ANNANDALE in 1906 [3], could not figure in his list. Thus 25 species in all of this genus are now known: in GRUVEL's latest publication [4] a synoptical table is given for the determination of these species. He even enumerates (without ANNANDALE's species of 1906) 25 species, as he also reckons to this genus a Lepadid considered by STEBBING [5] to belong to another (and new) genus for which the name *Trichelaspis* had been proposed by that carcinologist.

The cruise of the Dutch gunboat "Siboga" has supplied us with several forms belonging to this genus and I find that most of them must be considered as *novae species*. But before entering on the description of these forms, I consider it useful to give a summary of the descriptions of the known species in order to be able to judge of their relations and to understand the difficulties of the classification.

AURIVILLIUS (l. c. p. 20—26) was the first who discovered a species of *Dichelaspis*, and even five of them, without terga; in one of these species the carina is also wanting. I was at first inclined to separate these species from the genus *Dichelaspis*. It would perhaps be more in accordance with DARWIN's original views, when only such forms were accepted as species of this genus which had five valves and a scutum divided into two segments. This at least is the original diagnosis of the genus. STEBBING therefore pointed out, that it would be difficult to maintain the species of AURIVILLIUS as species of the present genus. Yet looking at the question again I finally embraced the opinion of AURIVILLIUS in this matter. The structure of the body of these problematic *Dichelaspis*-species corresponds essentially with that of the typical, the genuine, species of the genus, and in one of these species *(D. cor)* not only are the scuta very typical *Dichelaspis*-scuta, divided into two segments and with the primordial valves at the rostral angle, but the capitulum has the position of the tergum distinctly indicated, as it is limited by a chitinous cushion, towards the margin of the scutum as well as towards that of the carina. Thus it would be extremely difficult and even unnatural not to consider that species as a *Dichelaspis*, and once this is agreed upon, the other species are to be accepted also, as they represent further stages in the degeneration of the valves of the capitulum in the same direction as shown by *D. cor*, the last stage — so far as known at present — being occupied by *D. bullata* Aurivillius, which species has no terga and no carina.

GRUVEL's new species *D. Maindroni* and *D. Coutierei* much resemble the form called *D. cor* by AURIVILLIUS and these belong by all means to the same section of the genus, which section now counts seven species: five of AURIVILLIUS and two of GRUVEL. These seven species most likely have another point of agreement, in that they are all living in a semi-parasitic way in the branchial cavity or even attached to the branchiae of large brachyurous or macrurous crustaceans. Four of the species of AURIVILLIUS were even taken from the same *Palinurus*, not species only but specimen, found stranded on the coast of one of the Thousand Islands, Java.

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[1] GRUVEL, A., Bulletin du Muséum d'histoire naturelle, 1900, n° 3, p. 109.
[2] LANCHESTER, W., Crustacea of the Skeat Expedition. Proceed. Zool. Soc. London, II, 1902.
[3] ANNANDALE, N., Stalked Barnacles in the Colombo Museum. Spolia Zeylanica, III, Part XI, 1906.
[4] GRUVEL, A., Monographie etc. 1905, p. 140—141.
[5] STEBBING, T. R. R., A new Pedunculate Cirripede. Ann. & Mag. Nat. Hist. (6), XIII, 1894, p. 443.

It is not my task to discuss the good standing of these seven species, some of which on closer examination might probably be found to be identical; but I wish only to point out that there is, no doubt, sufficient reason to admit a causal nexus between the simplified structure of the capitulum and the mode of life of these forms.

Considering these seven species as a group of more or less degenerated forms, 18 (19) species of typical *Dichelaspis* remain. Of the latter those species in which the valves have the most complete development and show the greatest resemblance to the valves of the nearly related genera *Poecilasma* and *Lepas*, are most likely to represent the more original form. In this regard the species described by me as *D. sessilis*, by ANNANDALE as *D. tenuivalvata* and by LANCHESTER as *D. occlusa* are the first to be named: their scutum is rather broad, their tergum has the triangular shape of the species of *Lepas* and their carina is likewise broad. Next come the species *D. Warwicki* Gray and those which are nearly related to it: *D. Hoeki* Stebbing, *D. antiguae* Stebbing, *D. alata* Auriv., *D. Aurivillii* Gruvel and *D. equina* Lanchester. In all these species the scutum is composed of a narrow occludent segment and a much wider basal segment which, as a rule, has a triangular shape. With the more or less developed and broad tergum these valves cover a good deal of the surface of the capitulum. The carina of these species terminates in a rectangularly inflected disc [1] extending over a good deal of the base of the capitulum. These five species (with *D. Forresti* (Stebbing), six [2]) form together another very natural group of species in the genus *Dichelaspis*. It is quite another question whether all these forms are really distinct species — but this can only be made out by comparative study of all the original specimens, which study is not for me to undertake.

Which species should come next? To judge from the form of the carina *D. pellucida* Darwin would be nearly related to *D. Warwicki* Gray; to judge from the form of the tergum *D. orthogonia* would be the nearest relative of the latter species and I think it would be very difficult to decide which characteristic is the more important. There remain 12 species, all of them with rather narrow valves leaving a great deal of the capitulum uncovered. These can easily be divided into three natural and distinct groups. *D. orthogonia* Darwin forms a group of its own amongst the hitherto known species: it has a triangular tergum with three (four) prominent ridges and the carina terminates downwards in a small crescent-shaped cup: it is to this group of the genus that two of the forms collected by H. M. S. "Siboga" in the Malay Archipelago and to be described later belong. *D. pellucida*, which has the carina much like that of *D. Warwicki*, has the tergum of quite a different shape: like a battle-axe as DARWIN describes it; not only *D. Grayi* Darwin but also *D. lepadiformis* Gruvel come very close to *D. pellucida* and if they are indeed distinct species they really form together an extremely natural group.

The same holds good for *D. Lowei* Darwin, *D. Darwini* Filippi, *D. neptuni* Macdonald,

[1] According to AURIVILLIUS the carina of his species *D. alata* terminates in a fork. Should this really be the case, this species would form a serious exception. But A. had at his disposal one specimen only and this specimen most probably has not been dissected for the study of the carina. But without doing so, I think it is hardly possible to make out the shape of the terminal part of the carina..... Perhaps he only had the impression that the terminal part was a fork, its two teeth being really united by a disc-like plate?

[2] I think GRUVEL is right in considering STEBBING's *Trichelaspis Forresti* to be a *Dichelaspis*. I think it belongs to the same section of the genus as *D. Warwicki*.

D. Aymonini Lessona et Tapparone Canefri, *D. sinuata* Aurivillius, *D. trigona* Aurivillius and *D. Vaillanti* Gruvel. All these species agree in so far as they have rather narrow valves leaving a great deal of the capitulum uncovered, and also in that the carina terminates downwards in a fork. But here I wish again to emphasize, that though we must accept all these species for the present I am not convinced that they really are so many or so distinct.

The forms of *Dichelaspis* collected during the cruise of the "Siboga" belong to five different species: *D. Weberi* n. sp., *D. Nierstraszi* n. sp., *D. Tydemani* n. sp., *D. Versluysi* n. sp. and *D. orthogonia* Darwin. The four new species are named after those who have the merit of having done the scientific work on board the ship during the cruise. Of the new species *D. Nierstraszi* and *D. Tydemani* are both nearly related to *D. Warwicki* Darwin and doubtless belong to the same section of the genus; *D. Weberi* and *D. Versluysi* show — the latter more than the first — a well-marked affinity to DARWIN's *D. orthogonia.*

Thus we would now have 32 species of *Dichelaspis*, which might be classified according to their mutual affinities in the following way:

I. Species, in which the valves show the highest development, covering a great deal of the surface of the capitulum.
D. sessilis (type-species), *D. tenuivalvata* and *D. occlusa* (3 known species).

II. Species, in which the valves show a somewhat less development, with a relatively broad scutum and the carina terminating in a rectangularly inflected disc.
D. Warwicki (type-species), *alata*, *antiguae*, *equina*, *Aurivillii*, *(Forresti)*, *Hoeki*, *Nierstraszi*, *Tydemani* (9 known species).

III. Species, in which the valves are considerably less developed than is the case in the species of group II, in which however the carina has the same form as in the species of that group.
D. pellucida (type-species), *Grayi*, *lepadiformis* (3 known species).

IV. Species having the same development of the valves as those of group III, but with a tergum corresponding in form to that of the species of group II.
D. orthogonia (type-species), *Weberi*, *Versluysi* (3 known species).

V. Species with five valves, the narrowness of which causes a great part of the capitulum to be uncovered.
D. Lowei (type-species), *Aymonini*, *Darwini*, *neptuni*, *sinuata*, *trigona*, *Vaillanti* (7 known species).

VI. Species with three valves only, terga wanting.
D. cor (type-species), *angulata*, *aperta*, *Coutierei*, *cuneata*, *Maindroni* (6 known species).

VII. Species with two valves only (terga and carina wanting).
D. bullata (type-species), 1 known species.

Of these 32 species about one half (14, 15 or 16) have been observed in the Malay Archipelago, viz.

D. occlusa, East coast of Malay Peninsula: Tungganu (LANCHESTER).
D. Warwicki, off Borneo (DARWIN), Java Sea, near Batavia (AURIVILLIUS).

D. alata, Java Sea: Thousand Islands (Aurivillius).
D. equina, East coast of Malay Peninsula: Trengganu (Lanchester).
D. Nierstraszi, Malay Archipelago, different Stations, see later!
D. Tydemani, near Saleyer, see later!
? *D. pellucida*, Indian Ocean (Darwin), Oriental species with fairly extensive distribution (Annandale).
? *D. Grayi*, Tropical, Indian or Pacific Oceans (Darwin).
D. Weberi, Off Great Kei Island, see later!
D. Versluysi, Malay Archipelago, different Stations, see later!
D. orthogonia, Malay Archipelago, different Stations, see later!
D. sinuata, Java Sea: Thousand Islands (Aurivillius).
D. trigona, Java Sea: Thousand Islands (Aurivillius).
D. angulata, Java Sea: Thousand Islands (Aurivillius).
D. aperta, Java Sea: Thousand Islands (Aurivillius).
D. cuneata, Java Sea: Thousand Islands (Aurivillius).
D. Maindroni, Sumatra (Gruvel).
D. bullata, Java Sea: Thousand Islands (Aurivillius).

The seven species of Aurivillius enumerated in the above list were all of them taken from one and the same stranded specimen of a *Palinurus* spec. They were found attached to the branchiae or to the interior wall of the branchial cavity of that crayfish. The name of the species of *Palinurus* is not given, but it is no doubt permitted to suppose that it was a littoral form — no deep-sea species. *Dichelaspis Maindroni*, the species described by Gruvel, was also found attached to a *Palinurus* (whether all of them, or only those collected by Mr. Maindron is not distinctly indicated by Gruvel) and also seems to be a littoral form. For *D. Warwicki*, *pellucida* and *Grayi* no definite data with regard to their bathymetrical distribution could be given by Darwin. They are most probably all of them littoral forms: *D. Warwicki* was found attached to a crab, *Grayi* to the skin of a sea-snake, and *pellucida* also to a sea-snake — they are most probably forms which live at the surface of the sea. *D. equina* lives on shallow-water crabs and likewise *D. occlusa*.

The species collected by H. M. S. "Siboga" were found at different depths:

Dichelaspis Tydemani n. sp. at a depth of 10—25 m.
Dichelaspis Versluysi n. sp. at a depth of 22—32 m.
Dichelaspis Nierstraszi n. sp. at a depth of 27—59 m.
Dichelaspis orthogonia Darwin at a depth of 88—112 m.
Dichelaspis Weberi n. sp. at a depth of 560 m.

The last-named is thus the only true deep-sea species of the collection, and as will be seen from the description it is the largest of the known species. This is a peculiarity which also holds good for many other deep-sea species of Cirripedia (e. g. *Scalpellum*- and *Verruca*-species).

The other known deep-sea species of this genus *(D. sessilis)* was collected by the Challenger near the Azores at a depth of about 1800 m. All the other species are littoral forms, living at the surface or going down to depths of 30, 50, 100 m. at most. In accordance with this

all the species, so far at least as our present knowledge goes, have a limited geographical distribution. We need not forget, however, that our knowledge is rather imperfect as yet. In one of the last papers published on Cirripedia (that in which ANNANDALE describes the stalked Cirripeds of the Colombo Museum) we find in this regard as new facts that *D. equina* Lanchester from the east coast of the Malay Peninsula is common on the east coast of British India and that *D. pellucida* Darwin is an Oriental species which probably has a fairly extensive distribution. The latter, which has only been taken on sea-snakes, has not been collected during the cruise of the "Siboga".

1. *Dichelaspis Nierstraszi* n. sp. Pl. II, fig. 1—7.

Capitulum much compressed, with the apex produced. Scuta with the basal segment about as wide as the occludent segment, its carinal margin being very much hollowed out; terga with three unequal marginal projections the longest of which is nearly as wide as the occludent segment of the scuta. Carina terminating in a disc.

General appearance (Pl. II, fig. 1 and 2). Capitulum compressed, flat, slightly convex in the middle, with the apex produced. The valves are covered by a membrane which is thick and hairy especially in old specimens. In very young specimens the membrane also bears chitinous hairs. The carina is separated by a wide space from the scuta. Peduncle cylindrical, shorter than the capitulum.

The valves cover a large part of the surface in very small specimens (Pl. II, fig. 2*a*). In these the shape of the valves is also different.

Scutum (fig. 4*a*). It is formed of two slightly divergent and about equally broad parts, hanging together by means of a very narrow bridge. The occludent segment one fourth longer than the part representing the basal segment; both segments with the upper part the broader.

In some old specimens from the Tual anchorage, Kei Islands, the occludent segment of the scutum is considerably wider than the basal segment.

In very young specimens (fig. 2*a*) both segments of the scutum are relatively broader; this is especially the case with the basal segment, the shape of which is nearly triangular, with the carinal margin hollowed out. Fig. 3*a* represents the scutum of a middle-sized specimen, remarkable for having the upper part of the occludent segment rather narrow.

Tergum (fig. 4*b*). It has the lower part of about the same width as the occludent segment of the scutum; a narrow occludent segment forms a second projection which is separated by a deep notch from the carinal segment; the apex of the occludent segment of the scutum extends in the direction of this notch. A third and very short prominence is placed high up on the carinal margin just above the apex of the carina.

In very young specimens (fig. 2*a*) the three prominences of the tergum are not so well developed as yet; the middle one, the longest of the three, is the only one distinct. In middle-sized specimens (fig. 3*b*) the tergum has about the shape as the full-grown individuals.

Carina (fig. 5 and 5*a*). Much bowed, narrow, deeply concave within, extending up between the terga for $^2/_3^{rds}$ of their length, with a very characteristic curvature directed inwards just above the basal part. Downwards it terminates in a rectangularly inflected, deeply imbedded

disc, growing slightly wider towards its extremity, which terminally is not very deeply notched. This disc (fig. 5*a*) is not flat but hollowed out in the middle; it extends across over more than two-thirds of the base of the capitulum, beyond the middle of the basal segment of the scutum.

Peduncle cylindrical, as a rule slightly longer than half the length of the capitulum, about $^2/_3$rds of that length, or as long as the capitulum in specimens sitting crowded together; rather long also in the old specimens, collected at Tual anchorage, Kei Islands, one of which is figured Pl. II, fig. 1. The peduncle is distinctly ringed at the surface; the chitinous covering is studded with blunt beads of chitin externally and shows, in old specimens, scale-like excrescences with grooves between them. Delicate hairs are planted on the blunt beads of the surface; they are, however, more conspicuous in young specimens than in the full-grown. In the very old specimens from the Kei Islands the surface of the peduncle, like that of the capitulum, has a hairy felt-like coating.

Size. The largest specimen had a capitulum of 7,5 mm., most individuals however, are no longer than 4 mm. and a good many of the specimens are still smaller. The capitulum of the one figured, fig. 2*a*, only measured 2 mm., that of fig. 1, 6 mm.

Mouth. Labrum bullate, with small palpi bearing numerous bristles, some of them very long, at the apex. Teeth about 18, bead-like distally, triangular and close to one another in the middle.

Mandibles (fig. 6) narrow, with four teeth and the inferior angle formed by a group of very small teeth; teeth 2, 3 and 4 bearing an additional tooth near the extremity.

Maxillae (fig. 7) with a notch beneath the three upper spines, one of which is much stronger and one much shorter than the third. In the notch which is wide but not very deep four slender spines are planted, and the projecting part beneath the notch bears about seven moderately strong spines and a few hairs.

Cirri. First pair much shorter than and far removed from the second pair; seven segments in the longer and six in the shorter ramus. The shape of the segments is nearly quadrilateral, with the exception of the first segment which is of an elongated quadrangular form. Nearly the whole surface of the segments is clothed with spines, which grow longer and stronger towards the terminal segments. The second-sixth pair of cirri have both rami of equal length. The segments are rather long and bear as a rule four or five pair of spines on the anterior side and a tuft of small spines on the posterior near the junction of two segments. A few very delicate spines are scattered over the surface of each segment.

Caudal appendages narrow, thin, more than half as long as the pedicels of the sixth cirrus; a tuft of bristles, two or three of which are much longer than the others, is placed on the summit; no bristles or one isolated bristle on the sides.

Penis short, thick, terminating in a conical part bearing a tuft of extremely delicate hairs at its extremity.

General remarks. This species shows a certain resemblance to *D. Warwicki*; the differences, however, being numerous and, so far as I could make out, constant, there can be little doubt but that they represent different species. As in *D. Warwicki* the scutum and tergum of young specimens are different from the same valves in older specimens: the shape of these

valves in young specimens (fig. 2*a*) comes near to that of the same parts in *D. Hoeki* as figured by STEBBING. It is undoubtedly the most common form of *Dichelaspis* occurring in the Malay Archipelago; it was collected during the cruise of H. M. S. "Siboga" at about 20 different stations at depths varying from 9 to 112 m. They seem to be most numerous at depths not exceeding 55 à 60 m. and are found attached to different objects: stems and small branches of horny corallines, algae etc.

The specimens from different localities and depths show considerable variety in their general outline, size, shape of the valves, hairiness, the more or less complete calcification of the valves etc.: no doubt the species would present a very valuable material for the study of variation of a wild animal living under different conditions.

The following is a list of the stations where specimens of this species were collected.

Stat. 47. April 8—12, 1899. Bay of Bima (north coast of Sumbawa). Depth 55 m. Numerous specimens attached, with *Scalpellum rostratum* Darwin, to different small stems.

Stat. 60. April 27—28, 1899. Haingsisi, Samau Island, Timor. Depth 23 m. Numerous small specimens.

Stat. 65[a]. May 6, 1899. Lat. 7° 0 S., Long. 120° 34'.5 E. Depth 120 m. at least; coral bottom. One specimen.

Stat. 71. May 10—June 7, 1899. Makassar and neighbourhood. Depth up to 32 m. 8 specimens.

Stat. 77. June 10, 1899. Lat. 3° 27' S., Long. 117° 36' E. Depth 59 m. Fine grey coral sand. One fairly large specimen.

Stat. 80. June 13, 1899. Lat. 2° 25' S., Long. 117° 43' E. Depth from 50—40 m. Bottom: fine coral sand. One large, three smaller specimens attached to a piece of coral.

Stat. 99. June 28—30, 1899. Lat. 6° 7'.5 N., Long. 120° 26' E. Depth from 16—23 m. Lithothamnion-bottom. 3 specimens, one attached to a small Lamellibranchiate Mollusc.

Stat. 125. July 18—19, 1899. Anchorage off Sawan, Siau Island. Depth 27 m. Bottom: stone and some Lithothamnion. 3 specimens, with very short peduncles and very hairy.

Stat. 133. July 25—27, 1899. Anchorage off Lirung, Salibabu Island. Depth up to 36 m. Bottom: mud and hard sand. 4 specimens.

Stat. 144. Aug. 7—9, 1899. Anchorage north of Salomakië (Damar) Island. Depth 45 m. 2 specimens.

Stat. 164. Aug. 20, 1899. Lat. 1° 42'.5 S., Long. 130° 47'.5 E. Depth 32 m. Bottom: sand, small stones and shells. Numerous small and larger specimens.

Stat. 172. Aug. 26—28, 1899. Gisser; anchorage between this island and Ceram-Laut. Depth 18 m. Coral- and Lithothamnion-bottom. A dozen specimens with perfectly calcified valves.

Stat. 213. Sept. 26—Oct. 26, 1899. Saleyer anchorage and neighbourhood. Depth up to 36 m. Extremely numerous specimens attached to threads of corals, to one another etc.

Stat. 257. Dec. 11, 1899. Kei Islands, Du-roa Strait. Depth to 52 m. Bottom: coral. 3 specimens.

Stat. 258. Dec. 12—16, 1899. Kei Islands, Tual anchorage. Depth 22 m. Bottom: Lithothamnion, sand and coral. Several specimens, some of them very large.

Stat. 274. Dec. 26, 1899. Lat. 5° 28'.2 S., Long. 134° 53'.9 E. Depth 57 m. Bottom: sand and shells; stones. Numerous specimens, together with small barnacles (*Balanus* spec.).

Stat. 282. January 15—17, 1900. Lat. 8° 25'.2 S., Long. 127° 18'.4 E. Depth 27—54 m. Bottom: sand, coral and Lithothamnion. Numerous specimens attached to polyps etc.

Stat. 289. Januari, 20, 1900. Lat. 9° 0'.3 S., Long. 126° 24'.5 E. Depth 112 m. Bottom: mud, sand and shells. Two specimens.

Stat. 315. February 17—18, 1900. Anchorage East of Sailus Besar, Paternoster Islands. Depth up to 36 m. Bottom: mud and sand. Three specimens.

I have pleasure in naming this beautiful and interesting species after Dr. H. F. NIERSTRASZ, one of the Zoologists on board H. M. S. "Siboga".

2. *Dichelaspis Tydemani* n. sp. Pl. II, fig. 8—13.

Capitulum much compressed with the apex highly produced. Scuta with the basal segment triangular and the occludent segment broad, having the shape of a scalpel; terga with the lower part about as wide as the occludent segment of the scuta; carina much bowed, terminating in a disc, notched at its extremity.

General appearance (Pl. II, fig. 8). Capitulum compressed, flat. Valves not very close together. Valves thin and translucent, carina perfectly, other valves very imperfectly calcified. The membrane covering the valves with rather long hairs.

Scuta (fig. 9). The occludent segment is long, flat, pointed at its extremity; its occludent margin is straight, the carinal margin convex, whence the shape of the segment is that of a scalpel. The basal segment is triangular, small; only a small part of the valve is calcified: it stretches from the lower point of the occludent segment to one fourth of its length; what might be called the junction of the two segments is calcified, but no calcification is seen in the basal segment itself.

Terga (fig. 10). Scutal margin excised at a point vis à vis the apex of the scutum; the excision separates a smaller occludent projection from a larger carinal projection or lower part. Occludent margin simply and slightly curved. Incipient calcification at the umbo, where the valve shows an indistinct third prominence.

Carina (fig. 11). Much bowed, narrow, long. The basal end is rectangularly inflected and stretches internally to about the half of the diameter of the peduncle. The whole valve is calcified; the basal portion is slightly wider than the upper part and is excised at its extremity.

Peduncle narrow, especially close under the capitulum; about $^{2}/_{3}^{rds}$ the length of the capitulum.

Size. Very small, the capitulum measuring not quite 2 mm. in length.

Mouth. Labrum bullate. Mandibles (fig. 12) with four teeth and the inferior angle tooth-like and acuminated. Maxillae (fig. 13), with three larger spines at the upper angle, beneath which there is a triangular incision or notch, bearing two slender hairs. The edge beneath this notch is straight and projecting, and bears six or seven unequal but rather large spines.

Cirri. First pair short with the rami very unequal: the longest has five, the shortest four segments; the segments are nearly quadrangular with the exception of the first which is elongated; terminal segments small and blunt. Segments not thickly clothed with hairs or bristles; these are placed somewhat irregularly.

The other cirri have very long and slender segments, bearing three pairs of spines as a rule.

The caudal appendages are extremely slender but not longer than half the length of the pedicels of the sixth cirrus. They bear a few (about four) very delicate hairs at their ends.

The specimens are attached to long, yellowish-brown hairs or spines, which are hollow and bear triangular pointed teeth placed in irregular rows. They were taken, October 1899, near Saleyer anchorage, at a depth of 10—25 m.

Remarks. I am not quite sure that the specimens I have examined represent the full-grown form. Yet the shape of the valves and of the capitulum as a whole are so characteristic that it may be described as a distinct animal. In some regards it approaches *D. Warwicki* — but the much produced form of the capitulum makes it at once look very different, the shape of the scutum being moreover very peculiar.

The species is named in compliment to Captain now Commander G. F. TYDEMAN, the distinguished commander of H. M. S. "Siboga" during its cruise in the Malay Archipelago.

3. *Dichelaspis orthogonia* Darwin. Pl. II, fig. 14—18. Pl. III, fig. 1, 1A, 1B and 10*b*.

1851. DARWIN, Monograph, Lepadidae, p. 130, pl. II, fig. 10.

Since DARWIN published his Monograph, this species has not been observed so far as I know. DARWIN described it from British Museum specimens, habitat unknown. The "Siboga" collected a few specimens, south of Timor, at a depth of 112 m., and again at two other stations, 80 and 77, in the Archipelago: I think it very probable that the specimens studied by DARWIN had also been collected in the Malay archipelago.

I had at my disposal a few large and smaller specimens of this species. The largest has been drawn by me, magnified about 10 times, and is figured Pl. II, fig. 14. The capitulum of this specimen measures 6,6 mm., whereas DARWIN says that the length of the capitulum is above $^2/_{10}^{\text{ths}}$ of an inch, 5,1 mm. The other specimens of the "Siboga" are about that size, or still smaller.

The shape of the valves is much like DARWIN's description: I have prepared these valves from a 5 mm. specimen and figured them separately (fig. 15, *a*, *b*, *c*).

The scutum (fig. 15*a*) corresponds well with DARWIN's description; in the largest specimen however, the occludent segment is less than twice as long as the basal segment.

The tergum (fig. 15*b*) shows the four prominences in which the four ridges proceeding from the umbo end. The projection at the occludent margin of the valve is extremely small, smaller perhaps than in the figure given by DARWIN.

The carina (fig. 15*c* and fig. 16) terminates in a heart-shaped disc (fig. 16) with a slight excavation in the middle. This excavation in the specimen the valves of which I prepared was neither so deep nor so distinct as DARWIN has it in his description. The whole shape of the valve, however, so much resembles D.'s description and figures, that no uncertainty as to its identity could remain.

DARWIN's specimens were in a bad condition; of the peduncle he said that it was unknown, probably short. The "Siboga" specimens all have a peduncle: it is cylindrical and has about one third the length of the capitulum.

The different parts of the mouth correspond well with DARWIN's description. I give a figure of the maxilla (fig. 17) showing the notch (bearing one spine) beneath the three large, upper, unequal spines, and the highly projecting inferior part bearing eight spines in all, one of which (the third) is larger than the other ones. DARWIN says that this inferior part is, itself, obscurely divided into two steps — the maxillae of the specimen I dissected did not show this peculiarity.

Five specimens in all were taken; some of them were attached to cylindrical stems of a coralline organism most probably. The length of the capitulum of the largest specimen taken by the "Siboga" is 6,6 mm., that of its peduncle is about 1,6 mm. A young specimen is attached to the peduncle near its extremity.

The "Siboga" took these specimens at three different Stations:

Stat. 77. June 10, 1899. Lat. 3° 27′ S., Long. 117° 36′ E. Depth 59 m. Bottom: fine grey coral-sand. 1 specimen.
Stat. 80. June 13, 1899. Borneo Bank. Depth 50—40 m. Bottom: fine coral-sand. 1 specimen.
Stat. 289. January 20, 1900. Lat. 9° 0′.3 S., Long. 126° 24′.5 E. Depth 112 m. Bottom: mud, sand and shells. 3 specimens.

Formae dubiae. Though I have long been in doubt on the matter, I consider a few specimens (two large, two smaller and a few very small specimens) as belonging also to this species, which were collected by H. M. S. "Siboga" at Station 318 at a depth of 88 m., as also two small specimens taken at Station 294. Their shape is slightly different, being much flatter and the peduncle is shorter. The largest specimen has a capitulum over 7 mm. long and may be considered a full-grown specimen as it is furnished with well-developed egg-sacks. This animal is figured on Pl. II, fig. 18. In this specimen the proportion of the two segments of the scutum is different from what it is in the individual represented in fig. 14 of the same plate. Other differences are shown by the figures and are perhaps not important enough for minute description. Of one of the specimens of Station 318 I have prepared the valves and made with their aid the drawing fig. 1, Pl. III. I have made a drawing further of the smallest specimen of all (Pl. III, fig. 1 A), taken also at Station 318 and of one of the slightly larger ones (Pl. III, fig. 1 B) of Station 294. In that of Station 318 the shape of the shells is still quite different from that in the full-grown and those of Station 294, having a capitulum of 1,8 mm. in length, may be considered as forming the transition between the very small one with a capitulum of 1,25 mm. and the full-grown form.

The position of the stations where these forms were taken was as follows:

Stat. 294. January 23, 1900. Lat. 10° 12′.2 S., Long. 124° 27′.3 E. Depth 73 m. Bottom: soft mud with very fine sand. Two small specimens.
Stat. 318. February 22, 1900. Lat. 6° 36′.5 S., Long. 114° 55′.5 E. Depth 88 m. Bottom: fine yellowish grey mud. Several large and smaller specimens.

4. *Dichelaspis Weberi* n. sp. Pl. III, fig. 2—7.

Capitulum much compressed with the apex slightly produced. Scuta with the basal segment narrower than the occludent segment and not quite half as long. Terga with three unequal marginal projections on the scutal margin of the valve. Carina much bowed, internally very concave, terminating downwards in a small spatula-like disc.

General appearance. Capitulum compressed, flat. Valves relatively small, narrow, a large interspace between the carina and the other valves. Valves covered by a thin transparent membrane only. Peduncle cylindrical, much shorter than the capitulum (Pl. III, fig. 2).

Scutum (fig. 3*a*) consisting of two bars placed at right angles to each other, with the point of junction fully as wide as any part of the basal segment and perfectly calcified. The basal segment slightly tapering to the carinal extremity, the occludent segment widening considerably to the apex, which is obliquely truncated. The length of the occludent segment is slightly more than twice that of the basal segment.

Tergum (fig. 3*b*) of a triangular shape, with three ridges, terminating in three prominences of unequal length. The longest forms the basal point; of the two others that at the occludent margin is the shortest. In the angle between the latter two prominences the apex of the scutum in younger specimens fits exactly. In older specimens, like that figured in fig. 2, there is a distinct interspace between the apex of the scutum and the tergum. The valve is rounded at the umbo and shows a trace of a fourth prominence on the carinal margin just above the apex of the carina.

Carina (fig. 3*c* and 4). Much bowed, rather narrow, long; externally the central ridge is flattened towards the apex; internally the valve is concave, the concavity nearly reaching to the disc-like basal portion. The width of the carina remains almost the same over its whole length, with the exception of the basal portion which widens and forms a spatula, as figured in fig. 4.

Peduncle short, cylindrical, one third the length of the capitulum at most.

Size. The capitulum, in the largest specimen, is more than 10 mm. when measured along the occludent margin and about 12 mm. when measured from the apex of the tergum to the base of the carina. It is the largest of the known species of the genus.

Mouth. Labrum with the upper part bullate as in the other species of the genus; crest with a row of small triangular teeth. Palpi small, conical, moderately clothed with bristles.

Mandibles (fig. 5). Much like those of the other species of the genus: rather narrow, distance between the tips of the first and second teeth slightly shorter than that between the second tooth and the inferior angle. The inferior angle produced into an indistinct double spine.

Maxillae (fig. 6). Three large upper unequal spines and a fourth delicate one attached to the base of the third. Notch neither very wide nor very distinct, bearing two pairs of slender spines and a much stronger one half way to the beginning of the projecting inferior part. The latter bears nine or ten spines of unequal length and strength.

Outer maxillae (fig. 7) rather broad, general shape rounded-quadrangular. Covered with long bristles which moreover form a dense tuft all over the outer margin.

Cirri. First cirrus separated by a wide interval from the second pair; short, with the two rami unequal in length, though both consisting of seven segments. The segments are broad, quadrangular and thickly paved with long and slender spines. The other cirri have very long rami as well as pedicels.

Caudal appendages small and narrow with a few long spines at their ends.

H. M. S. "Siboga" took this fine species at:

Stat. 262. December 18, 1899. Lat. 5° 53′.8 S., Long. 132° 48′.8 E. Depth 560 m. Bottom: solid bluish-grey mud, upper layer softer and brown mud. In all 9 specimens.

I have great pleasure in naming this fine and characteristic deep-sea species after the leader of the "Siboga" expedition, Professor MAX WEBER. It was taken at a depth of 560 m., and thus may really be considered a deep-sea species.

It is a well-marked species: it shows a certain resemblance to *D. orthogonia* and belongs to the same section of the genus, but it differs from it by its size, as well as by the shape of the tergum and of the disc forming the base of the carina.

The present species and *D. sessilis* Hoek, dredged by the "Challenger" in the Atlantic, near the Azores, at a depth of 1000 fathoms, are the only known species of the genus *Dichelaspis* living at considerable depths.

5. *Dichelaspis Versluysi* n. sp. Pl. III, fig. 8—13.

Capitulum compressed, apex produced. Scuta with the basal segment much narrower than the occludent segment and more than half as long. Terga with three distinct marginal projections and a fourth one very small. Carina terminating downwards in an oval disc-like cup.

General appearance. Capitulum flat; valves small, a large part of the surface of the capitulum remaining uncovered. Valves covered by membrane so as not to be seen distinctly without isolating them. Peduncle cylindrical not quite half the length of the capitulum (Pl. III, fig. 8).

Scutum (fig. 9*a*). It consists of two bars placed in most of the specimens at right angles to each other, in one of the specimens (figured in fig. 9) at an angle of more than 90°. The point of junction is perfectly calcified. The basal segment uniformly narrow, the occludent segment, which is less than twice as long as the basal segment, grows much wider towards the apex. It is flat with the apex obliquely truncated.

Tergum (fig. 9*b*) of a triangular shape, with three ridges terminating in three prominences of unequal length. Seen from the outer side the three divisions are separated from one another by distinct, even deep furrows. The fourth ridge or prominence is extremely small and situated at the carinal side just above the apex of the carina.

Carina (fig. 9*c*). Much bowed, even slightly more than is the case in *D. Weberi*, long, not very narrow, keel-shaped in its basal part and with a flattened central ridge above the middle to as far as the apex. Internally the valve is concave. The basal portion is embedded and forms a cup of a very peculiar shape: it is oval with at each side a small wing, like the small handles of a bowl (Pl. II, fig. 10*a*, while fig. 10*b* shows the cup-shaped basal portion of a specimen of *D. orthogonia* with the same enlargement, seen from the same side).

Peduncle short, cylindrical; length about one third that of the capitulum. In most of the specimens the chitinous outer wall is transparent and surrounds the muscular part like a wide sack.

Size. Length of the capitulum in one of the larger specimens 6,3 mm. when measured from the tip of the tergum to the base of the carina. Several specimens, however, are considerably smaller. The largest specimen is over 7 mm.

The mouth and its parts in general resemble greatly the same parts in *D. orthogonia*: crest of the labrum with a row of small bead-like teeth; palpi with the two sides parallel, bearing towards the one side numerous very long bristles.

Mandibles (fig. 11, *a*, *b* and *c*) narrow with four teeth and the inferior angle produced either in a single tooth or in two smaller teeth: in two specimens the right mandible had the inferior angle terminating in two, the left in one larger tooth.

Maxillae having the three larger upper unequal spines and the notch beneath these as in *D. orthogonia*. In the notch two delicate spines are planted as a rule and the inferior slightly projecting part is indistinctly divided into an upper step with three and an under step with five or six spines. (In fig. 12 of Pl. III one of the maxilla of a specimen of this species is represented with only two large upper spines; the other maxilla of the same specimen had the normal number of three spines above the notch).

Outer maxillae, outline semi-elliptical rather than hemispherical; not sparingly covered with bristles. The longest bristles are planted near the middle of the outer margin of the maxilla.

Cirri. Pedicels and rami of the five posterior pairs are very long; segments much elongated, each bearing four pairs of very long spines and a fifth pair much shorter. Between each pair there is an excessively minute spine — as described by DARWIN for *D. orthogonia*.

Of the first pair, which is separated by an interval from the second pair, both rami are short and only slightly unequal in length; the number of segments is 6 in the shortest and 7 in the longest ramus. Both are paved moderately thickly with spines as in *D. orthogonia*.

Caudal appendages long and narrow, distinctly two jointed, with a number of long hairs or delicate spines at their ends and a few hairs planted here and there (Pl. III, fig. 13).

Penis short, thick; terminating in a narrower and curved part bearing a tuft of very delicate hairs.

This species was taken at:

Stat. 164. August 20, 1899. Lat. 1°42'.5 S., Long. 130°47'.5 E. Depth 32 m. Bottom: sand, small stones and shells. About 12 specimens.

General Remarks. I have some doubt as to whether I am right in considering this as a species; but as there are full-grown specimens with egg-lamellae in the collection and as these differ in the shape of the valves from *D. orthogonia*, to which this form in other regards shows great resemblance, I have thought it useful to give a description of it and to consider it as a separate species. I have the impression that several species in this genus have rather fluctuating characters, but it is quite impossible to make out how far the variation or the fluctuation of these characters goes without a very large material of specimens from the same locality as well as from different places.

The species is named after Dr. J. VERSLUYS, one of the Zoologists of the scientific staff of H. M. S. "Siboga".

Forma dubia. I have figured on Pl. III (in fig. 14) another form of *Dichelaspis*, which is represented by one specimen only. It belongs, no doubt, to the same group of species as *D. orthogonia*, *Weberi* and *Versluysi* and it shows in many regards great resemblance to *D. Versluysi* in particular: it has almost the same form — but, as it is at the same time

different in several more or less important details, I consider it as a variety of the last described species. Comparing the capitulum we see that the occludent segment of the scutum of this specimen is more than twice as long as the basal segment, and that it does not grow wider towards the apex but has about the same width throughout its length. The tergum of this specimen, though deeply furrowed like the same valves in *D. Versluysi*, does not show the fourth prominence just above the apex of the carina. The carina itself not only has almost the same general shape, but its basal portion has exactly the particular form which is so characteristic of *D. Versluysi*.

Only one specimen represents this form and this specimen, the length of the capitulum in which is about 6 mm., has been dissected to prepare the valves and to make out its identity: so that the "type" of this form no longer exists and this alone would be a reason for not introducing it into science as a new species. As, further, its relation to *D. Versluysi* is very close I think it right to indicate it as *D. Versluysi* Var. The single specimen was taken at:

Stat. 258. Dec. 12—16, 1899. Tual anchorage, Kei Islands. Depth 22 m. Bottom: Lithothamnion, sand and coral.

Genus **Megalasma** Hoek

HOEK, Cirripedia of the "Challenger", 1883, p. 50.

This genus was founded (1883) for a very characteristic Cirriped dredged during the cruise of the "Challenger". It belongs to the same natural group of genera as *Poecilasma*, *Dichelaspis* and *Lepas* and is nearly related to the first of these three.

In 1894 WELTNER[1] described a second species of this genus and gave it the name of *M. carino-dentatum*. A third was collected by H. M. S. "Siboga" in 1899.

The diagnosis given for this genus in the "Challenger" Report holds good for the forms discovered later, with one exception; the triangular form of the scutum which was so very striking in *M. striatum* is, strictly speaking, gone in *M. lineatum* (and so far as can be judged from the sketches of WELTNER, the same is the case in *M. carino-dentatum*), there being a distinct though short basal margin. Hence, I propose to have the diagnosis changed so far that the scuta are not called triangular but approaching more or less to a triangular form.

For the determination of the species known at present, the following table may be of use:

Megalasma

A. Dorsal margin of the carina developed into a broad flattened part forming the continuation of the downwards inclined portions of the tergum along their carinal margin . . . . . *M. striatum.*

B. Dorsal margin of the carina not forming a broad flattened part.

a. Dorsal margin of the carina having a tooth-like excrescence. . . *M. carino-dentatum.*

b. Dorsal margin of the carina without a tooth-like excrescence. . *M. lineatum.*

[1] WELTNER, W., Zwei neue Cirripedien aus dem Indischen Ocean. Sitz. Ber. Ges. Naturf. Freunde zu Berlin, 1894, p. 80.

M. striatum which was taken by the "Challenger" in the Philippine Archipelago at depths of 180 and 207 m. was collected by H. M. S. "Siboga" at different places in the Malay Archipelago at depths from 204 to 984 m. *M. carino-dentatum* was found on the stem of a *Hyalonema* from the Gulf of Bengal, dredged at 3200 m. *M. lineatum* was dredged in the Malay Archipelago from a depth of 450 m. So all the species may be considered as deep-sea forms, the range of depth over which they spread being very large. Hitherto, the genus has only been found in Asiatic Indian Waters.

1. *Megalasma striatum* Hoek.

1883. Hoek, Cirripedia of the "Challenger". p. 51, pl. II, fig. 5—9, pl. VII, fig. 8—9.

The "Challenger" collected this beautiful species in the Philippine Archipelago at a depth of 100 à 115 fathoms, about 180 à 207 meters, in November 1874.

It has not been observed, so far as I know, from that date until H. M. S. "Siboga" dredged some specimens in 1899 at different stations, viz.

Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand. Numerous specimens attached to the spines of an Echinus. The largest specimen measures 10,5 mm.

Stat. 253. December 10, 1899. Lat. 5° 48′.2 S., Long. 132° 13′ E. Depth 304 m. Bottom: grey clay, hard and crumbly. One small specimen attached to the spine of an Echinus.

Stat. 267. December 20, 1899. Lat. 5° 54′ S., Long. 132° 56′.7 E. Depth 984 m. Bottom: grey mud with a brown upper layer. One specimen attached to the silicious skeleton of a sponge.

The range of depth of this species is now found to be much greater than could be judged from the results of the Challenger: we are now permitted to say that this species is one of those capable of existing at a considerable variety of depth.

At the same Stations where this species was collected, other Cirripedia were also brought up with the dredge; thus, at Station 251: two species of *Poecilasma*, four species of *Scalpellum*, one of *Balanus* etc.; at Station 253: three species of *Poecilasma* etc. The conditions must be particularly favourable for the development of Cirripedia at these Stations! With reference to this, see my Report on the Cirripedia of the "Challenger", p. 25.

2. *Megalasma lineatum* n. sp. Pl. IV, fig. 1—8.

Scutum with the carinal margin bowed, considerably longer than the straight tergal margin and with a distinct though short basal margin. Tergum triangular, small. Carina with the lower end truncate and very wide, the upper end narrow and elongated. Peduncle extremely short.

General appearance. Pl. IV, fig. 1 and 2. Capitulum elongated, about twice as long as broad, swollen in the middle. The short peduncle extends from underneath the capitulum. The short basal margin of the scutum forms the continuation of the truncate basal margin of the carina. The valves are delicately striated; strips of membrane run over the lines separating the valves.

Scutum (fig. 1 and 3*a*) elongated, not exactly triangular, there being a short basal

margin, which in the larger specimen is more distinct than in the smaller. The carinal margin bowed and longer than the tergal margin; where these margins meet an obtuse angle is formed and from this angle a not very prominent ridge runs to the occludent margin. This is the only ridge on the outer surface of the scutum. Internally a not very prominent ridge runs along the lower half of the occludent margin, whereas a much more prominent and bowed ridge separates a small basal portion from the rest of the valve. Where these two ridges meet, near the occludent margin, a relatively strong tooth having the shape of a little nail, is formed.

Tergum (fig. 1 and 3*b*) triangular, relatively small. Carinal margin and scutal margin have about the same length; the former does not show the flattened border which is so characteristic for *M. striatum*.

Carina (fig. 2, 3*c* and 4) broad towards its basal end, much bowed, terminating upwards in a narrow flat part which runs up to the basal ends of the terga. The flattened dorsal margin is narrow and has about the same breadth throughout its length. The base is abruptly truncated. The scutal margin at one third of its length from the base shows a small tooth or excrescence which fits into an indistinct excavation in the carinal margin of the scutum. This detail of the structure seems more strongly developed in younger specimens — it cannot at any rate be made out so sharply in full-grown specimens without isolating the valves.

Peduncle very short, slightly extending from underneath the capitulum.

Size. The largest specimen has a capitulum of 1 cm. in length.

Mouth. Labrum (fig. 5) bullate; crest with a row of numerous (± 40) small triangular teeth; Palps small, hairs numerous at the tip and along the interior margin.

Mandibles (fig. 6) with four teeth, the inferior angle terminating in a single delicate spine. The distance between the tips of the first and second teeth one and a half times as great as that between the tips of the second and third.

Maxillae (fig. 7) with three spines at the upper angle, the notch beneath the upper spines relatively large and the inferior raised part rather narrow. There are three delicate hairs or spines planted in the notch, and about ten larger ones on the part beneath the notch.

Outer maxillae of a quadrangular shape with rounded edges. Numerous, delicate hairs planted on the outer surface, the largest along the outer margin.

Cirri. First pair far removed from the second pair with very short rami. Rami not so much differing in thickness, much more so in length. The longest ramus has ten, the shortest nine segments. Spines planted over a great part of the surface of each segment. The second cirrus has about the same shape and structure as those following: each ramus consists of long and narrow segments; two stronger and a third much more delicate spine are planted at the convex side near the extremity of each segment; the concave side having as a rule three stronger pairs of spines and a fourth very delicate pair. An extremely delicate spine is inserted in the angle formed by each pair of stronger spines.

Caudal appendages (fig. 8). Very short, terminating abruptly and broad, and bearing a not very large number of fairly strong hairs at its truncated extremity.

Penis in the specimen that was dissected broken off; the part attached to the body cylindrical with hairs here and there.

This species was taken at:

Stat. 74. June 8, 1899. Lat. 5° 3'.5 S., Long. 119° 0' E. Depth 450 m. Bottom: Globigerina ooze (obviously a thin layer). Two specimens, which, according to the label, were attached to a spine of *Goniocidaris florigera*.

General Remarks. Long after the above description was written, I found in ANNANDALE's "Preliminary Report on the Indian stalked Barnacles" (published April 1906)[1], that a form of *Megalasma* occurs in the Andaman Sea at a depth of 290—775 m. which "agrees in every respect with HOEK's *striatum* from the Philippines, except that the semicircular ridge on the lower part of the capitulum, which forms a conspicuous feature in the latter, is quite absent". ANNANDALE has called this form a subspecies (*M. striatum*, subsp. *minus* nov.), not a variety, "because it seems to represent a well-defined local race, differing only slightly from the typical form, but with a constant difference".

This is the only information at hand regarding this "subspecies" — no figure is given. I would not be astonished, however, if this form and my new species *M. lineatum* proved to be identical[2].

Genus **Alepas** Sander Rang

DARWIN (1851) enumerated four species of the genus *Alepas*: two of these he saw and investigated himself (*A. minuta* Philippi and *A. cornuta* Darwin), the two others (*A. parasita* Sander Rang and *A. tubulosa* Quoy et Gaim.) were known to him only from figures and descriptions published by QUOY & GAIMARD, SANDER RANG and LESSON. The "Challenger" collected a fifth species of this genus which was described by me in 1883 as *A. pedunculata*. Six other species have since then been added to the list, viz. two by AURIVILLIUS[3] (*A. quadrata* and *A. japonica*) and four by GRUVEL[4] (*A. Belli*, *A. indica*, *A. microstoma* and *A. Lankesteri*). The latter author in his "Monographie" (1905), p. 164, has given a synoptical table for the determination of the 11 species of this genus known to him.

Since then, ANNANDALE[5] has described three more species of this genus, viz. two (1905): *A. gigas* collected in Bali Straits and *A. malaysiana* dredged in Gaspar Straits, and one (1906): *A. xenophorae* found off the S. W. coast of (English) India.

To this number of 14 species come those dredged by the "Siboga" on different occasions in the Malay Archipelago. They represent in all five different forms, which I think must all be considered as new species. Two of the new forms are however represented by one specimen only and as it is impossible to describe these without dissection, I shall only give a figure with a short description of the outward shape: they have been named *A. ovalis* (taken W. from the Key Islands at a depth of 984 m.) and *A. tenuis* (S. of Ceram at 204 m. depth).

The other three new species are represented by numerous specimens. I propose to name

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1 Annals and Magazine of Natural History. (7), XVII, April 1906, p. 399.

2 A good figure is given in the "Illustrations of the Zoology of the R. I. M. S. S. Investigator" Calcutta, 1907. ANNANDALE's subspecies and my new species are identical. (Note added during press).

3 AURIVILLIUS, C. W., Studien über Cirripedien. K. Svensk. Vetensk.-Akad. Handl. XXVI, N° 7, 1894, p. 28—32.

4 GRUVEL, A., Sur quelques Lépadides nouveaux de la collection du British Museum Trans. Linn. Soc. VIII, 8, London, 1902.

5 ANNANDALE, N., Malaysian Barnacles in the Indian Museum. Memoirs of the Asiatic Society of Bengal, I, 1905, p. 80—81. —— Preliminary Report on the Indian Stalked Barnacles. Ann. and Mag. Nat. Hist. (7), XVII, April 1906, p. 399.

them *A. morula*, *A. intermedia* and *A. lithotryae*. The first was collected between Borneo and Lombok at a depth of 538 m., the second N.W. from the Key Islands at 90 m. depth, the third near South Lucipara Island at a depth of 894 m. attached to the valves of *Lithotrya nicobarica*. The last species has, not unlike *A. quadrata* Auriv., horny, nearly quite hidden scuta; *A. morula* can be recognised at once by the very peculiar structure of the capitulum; and *A. intermedia* stands so far as the structure of the 5th and 6th cirrus is concerned between the species with quite normal rami and those in which the inner ramus is quite rudimentary.

Including the 5 species from the "Siboga" we now have 19 species of *Alepas* in all. The absence of calcareous parts or valves which facilitate the separation of the species in other genera (in *Scalpellum* e. g.) makes this distinction a troublesome one in *Alepas*. The outward shape of the capitulum, the length and proportions of the peduncle are liable to change with the age, under the influence of the fluid used for the conservation etc. The question whether all the species described are really good species in the case of *Alepas* is more difficult to answer than for the other genera. Yet, considering the circumstances under which they were taken (different objects or animals to which they were found attached, different depths, geographical distribution) there can be no doubt, I think, but that most of the species are really different forms.

The following table enumerates all the species at present known, arranged according to their bathymetric occurrence with indication of their geographical distribution. The species found in the Malay Archipelago are marked with an asterisk.

Alepas Lankesteri Gruvel. 1465 m. Mona Channel, West Indies.
**Alepas ovalis* n. sp. 984 m. W. from the Key Islands.
Alepas pedunculata Hoek. 740 m. Off New South Wales.
**Alepas morula* n. sp. 538 m. Between Borneo and Lombok.
Alepas minuta Philippi. 355—250—100 m. Mediterranean, Atlantic Ocean.
Alepas xenophorae Annandale. 333 m. S. W. Coast of (English) India.
**Alepas gigas* Annandale. 290 m. Bali Straits.
**Alepas tenuis* n. sp. 204 m. South of Ceram.
**Alepas intermedia* n. sp. 90 m. N.W. from Key Islands.
Alepas japonica Aurivillius. 80 m. Japan Sea, Hirado Street.
**Alepas malaysiana* Annandale. 55 m. Gaspar Straits.
**Alepas lithotryae* n. sp. Reef. Near South Lucipara Island.
Alepas tubulosa Quoy & Gaimard. On *Palinurus* (Coast?). New Zealand.
**Alepas quadrata* Aurivillius. On *Palinurus* (Coast?). Thousand Islands (Java).
Alepas cornuta Darwin. ? West Indies: St. Vincent.
Alepas parasita Sander Rang. Surface (on *Medusae*). Mediterranean, Atlantic Ocean.
Alepas Belli Gruvel. ? Cuba.
Alepas microstoma Gruvel. ? Madeira.
**Alepas indica* Gruvel. Surface (on floating wood). Singapore and Nicobars.

Thus, we see that of the 19 species described in the literature 9 or about the half have been observed in the Malay Archipelago; in this region, the genus may indeed be called prolific.

As most of the species of this genus — with but very few exceptions — have been observed only once as yet, no conclusions can be drawn with regard to the bathymetric range in relation to the geographical distribution.

1. *Alepas morula* n. sp. Pl. IV, fig. 9—12.

Capitulum globular, its surface with numerous tubercles. No scuta. Orifice small, not protuberant. Peduncle more than half as long as the capitulum. Inner rami of the 5th and 6th cirrus as strongly developed as the outer rami.

Capitulum (Pl. IV, fig. 9) globular, with the carinal edge somewhat projecting like a crest, entirely destitute of valves, but with the thick chitinous envelope showing large tubercles all over its surface, giving the animal a certain resemblance to the fruit of the mulberry. The colour of the specimens conserved in alcohol is a greyish yellow, the peduncle being brownish. Indistinct brown or reddish transverse lines run over the surface of the capitulum. Orifice small, hardly protuberant, its edges sinuous.

Peduncle rather long, narrower than the capitulum, into which it insensibly blends; its surface very uneven, partly from being wrinkled, partly in consequence of the chitinous envelope bearing tubercles, which are however smaller than those of the capitulum. Surface of attachment not very wide.

Size. The length of the capitulum and the peduncle together is 10,5 mm. in one of the larger specimens, the capitulum alone measuring 6,5, the peduncle 4 mm.

Mouth. The labrum (fig. 10) has on its free margin a continuous row of 24 short, strong and blunt chitinous teeth. This row of teeth describes an arch, 14 of the teeth form the middle part and 5 are planted on each side. Numerous minute hairs or bristles are scattered over the teeth, larger and stronger hairs outside the teeth, especially beyond the attachment of the palpi.

The palpi are triangular, elongated. Their tips are at considerable distances from each other: even the bristles planted at the extremity do not touch each other. These bristles are strong and doubly serrated.

The mandibles (fig. 11 and 11*a*) have three teeth and the inferior angle, which by some authors is considered a fourth tooth, ends in the specimen I dissected in a single sharp spine at the right side (fig. 11*a*), in two distinct teeth at the left side (fig. 11). First tooth not so far from the second as the latter is from the inferior angle. The second and third teeth pectinated.

The maxillae (fig. 12) have a notch beneath the three upper spines. Of these one is considerably larger than the other two. In the notch are several spines, three or four of which are stronger than the others. The edge beneath the notch bears numerous strong and smaller spines and is indistinctly divided into two steps.

Outer maxillae quadrangular with rounded edges; a dense tuft of serrated bristles is directed towards the mouth opening, a less dense group of smooth hairs or bristles is directed towards the base of the maxillae.

Cirri long, with short and numerous segments, with the exception of those of the first pair which are rather short and broad.

First cirrus placed far from the second; its pedicel is relatively long, its rami short, slightly unequal, the longest has also the broadest segments; both rami have eight segments, the last being very minute. The segments on both rami bear strong bristles placed in a row near the anterior extremity of each segment. The segments of the strongest ramus have further a dense clothing of bristles on the side which is directed towards the more slender ramus. Whereas the small terminal segment of the more slender ramus bears three strong spines, the same segment of the stronger ramus has one slender spine only; further a number of extremely small hairs are placed at its extremity. In the row of bristles at the extremity of the sixth and seventh segments of the stronger ramus two or three bristles are wanting; minute scales are present at the places left open. Beneath the basal articulation of the first cirrus a long filamentary appendage is situated.

Second to sixth cirrus much resembling each other, their length and the number of the segments slightly increasing from the second to the sixth; in the second each ramus has 13 à 14, in the sixth 16 à 17 segments. The pedicels and the lowermost segments of the rami of the second and third cirri are much more densely clothed with hairs than the same parts of the fourth—sixth cirri. As a rule each segment of each ramus bears a row of bristles near its extremity, two very strong bristles on the dorsal face of each segment near the articulation of the following segment and a group of bristles on the ventral face, also near the extremity of the segment. The ventral face of most segments shows a row of very short stiff hairs, giving it the appearance of being serrated.

The rami of the 5th and 6th cirri are slightly unequal; the outer ramus has 17, the inner only 15 segments.

Caudal appendages long, reaching as far as the end of the fifth segment of the rami of the sixth cirrus, composed of 14 very slender segments each with a number of very delicate bristles or hairs on its summit.

Penis indistinctly ringed or segmented, tapering towards the extremity; numerous delicate hairs scattered over its surface and a dense tuft of slightly stronger hairs at its extremity.

One of the specimens I investigated was furnished with eggs which were united in one egg-mass. The eggs were extremely numerous and very small. Most of them contained Nauplii and many seemed to have come out before the animal was caught and put into the preserving fluid. The form of the eggs was long-oval, their length was 0,3, the greatest breadth 0,13 mm. Larvae without eyes or without black pigment in the eyes.

This species was taken at:

Stat. 316. February 19, 1900. Lat. 7° 19'.4 S., Long. 116° 49'.5 E. Depth 538 m. Bottom: fine, dark brown sandy mud.

The specimens were found attached to the spines of *Porocidaris elegans*, a sea-urchin which was caught with the trawl. There are in all a dozen large and about as many smaller specimens. Often one or two large and a few smaller specimens form a group, being attached near one another to the same spine.

2. *Alepas intermedia* n. sp. Pl. IV, fig. 13—16.

Capitulum oval, surface smooth, no scuta. Orifice narrow, not projecting. Peduncle stout, nearly as long as the capitulum. Inner rami of the 5th and 6th cirri slightly shorter than the outer rami.

Capitulum of an oval shape (fig. 13), apex bluntly pointed, carinal margin strongly bowed, rostral margin also bowed but less strongly. Orifice a narrow slit, which from being exactly in the longitudinal axis is hardly visible, when the animal is seen laterally. The capitulum is entirely devoid of scales or valves; its surface is smooth, one or more indistinct furrows excepted, which start from the rostral edge and describe curves over the surface. The capitulum blends insensibly into the long and strongly developed peduncle, the surface of which is either nearly quite smooth, or indistinctly ringed transversely.

The peduncle is somewhat compressed laterally: the shape of a transverse section is oval, not circular.

Size. The figure 13 represents one of the larger specimens. It has a capitulum about 1 cm. and a peduncle about 0,8 cm. long.

The body and its appendages are in general as in the other species of the genus. I wish to point out only the following characteristic features.

Mouth. Of the labrum (fig. 14) not only the middle part of the crest is furnished with a row of teeth, but also each lateral part. Those of the middle part are blunt, shorter in the middle than at the sides, whereas those of the lateral parts are sharp, hook-like. The middle part has about 20 teeth, each lateral part 8—10.

The palpi are perhaps not quite so long and narrow as in the other species of the genus; they have a dense row of rather long and strong bristles on the outer border and these bristles are doubly serrated.

The mandibles (fig. 15) have three teeth and the inferior angle. The latter ends in a single sharp spine. The distance between the first and second teeth corresponds exactly with that between the spine of the inferior angle and the second tooth. The lower edges of the first, second and third teeth of the mandible appear pectinated, owing to the presence of short strong spines projecting from the sides of the teeth.

The maxillae (fig. 16) have a triangular shape, with the edge rather long; the notch beneath the three larger upper spines and two other shallow notches about the middle of the edge give it an irregular appearance. The spines are very unequal in strength and size: a few are large and strong, the smaller ones are more numerous. The apodeme is rather long.

The outer maxillae are square in shape, broad with the angles rounded. The bristles form thee distinct groups: some rather long are planted round the free outline and cover the superior part of the dorsal face of the maxilla. A second group consists of short and rather stiff bristles planted close to the margin at which the two maxillae touch one another. The bristles on the basal part of the maxilla are long and delicate and form a third and much less dense group near the so-called olfactory orifice.

The cirri are but slightly curled; though the pedicels are rather long the shortness

of the rami causes the whole cirrus to be short. The first pair is placed near the mouth and at some distance from the second. Its rami are nearly equal and composed of five segments only. The first segment is very long, longer than the other four segments together and not quite distinctly composed of four or five short and broad segments soldered together. Segments 2—4 are of a very characteristic pentagonal shape, segment 5 is short, small, quadrangular. The slightly shorter ramus is at the same time a little narrower. It can be said to have one segment more than the longer ramus, as the last segment of those which are soldered together to form the first segment of the longer ramus has remained free in the shorter one. Each segment bears a broad group of long bristles on its outer surface; the first segment shows 4 or 5 such groups of bristles. The last segment has the bristles planted close to its extremity. On the inner surface the bristles are less numerous and not placed so regularly, on the outer segments they form a row near the extremity. Along the dorsal margin, each segment bears a long bristle planted slightly above the middle of its length.

The pedicel of the first cirrus is much shorter than that of the other cirri. The filamentary appendage is seated beneath the basal articulation of the first cirrus; it is long, conical and pointed at its extremity.

The 2nd cirrus has ten segments in both rami, the 3rd 11 in the shorter and 13 in the longer ramus; the 4th has 12 and 13 segments, the 5th and 6th 13 and 15 — at least these were the numbers in the specimen I investigated more carefully. The pedicels are long, the segments short, slightly longer only than broad. Each segment is protuberant at the anterior face, a little beneath the articulation with the following segment. On this protuberance is planted a dense brush of bristles; a transverse row of bristles is also inserted on the outer side near the extremity of each segment. In the upper segments these bristles have the character of thick and claw-like spines. On the inner side the bristles are less strong and also less numerous. They form distinct rows only on the upper segments.

The basal segment of each ramus is in most cirri indistinctly divided into two segments. Thus the 6th cirrus might as well be said to have 13 and 15 as 12 and 14 segments.

The caudal appendages are rather long and delicate. In one of the specimens I dissected the one consisted of 8, the other of 10 joints. In length they equal the pedicels of the 6th cirrus, the 10-jointed one being slightly longer. The basal segments are short and broad, the middle long and narrow, the upper very narrow, but not so long as the middle ones. The short and thin bristles are planted on the extremity of each segment, the terminal segment being furnished with a tuft of bristles.

The penis is thick and long, curled together in a curious way, tapering towards the extremity, where its end is indistinctly bilobed. The articulations are not very plain, yet the basal as well as the terminal portion can be said to be ringed, there being an intermediate part where the rings can hardly be distinguished. Very long and delicate hairs are scattered over the surface, forming a somewhat irregular tuft at the extremity in the little furrow between the two points or lobes.

The eggs are small and very numerous. I found a single lamella only. The eggs in the specimen I have investigated were far advanced in development: most of them contained

the Nauplii ready for hatching; these larvae showed no trace of pigment in the eyes. The greatest diameter of the egg is 0,22 mm.

The specimens taken by the "Siboga" were attached to stones and shells.

This species was collected at:

Stat. 260. December, 16 and 18, 1899. Lat. 5° 36'.5 S., Long. 132° 55'.2 E. Depth 90 m. Bottom: sand, coral and shells. [2,3 miles N. 63' W. from the north point of Nuhu Jaan, Key Islands].

General Remarks. This is an interesting species, forming a link between the species with quite normal rami in the 5th and 6th cirri and those in which the inner ramus of these cirri is quite rudimentary. The "Siboga" took four large and several smaller specimens of this species. I think it worth while to note, that the orifice of the capitulum, which is a narrow slit in the full-grown specimens, is broad and nearly circular in the small. In some regards this species seems to resemble *A. xenophorae* Annandale — a figure of that species might at once settle this question [1].

3. *Alepas lithotryae* n. sp. Pl. IX, fig. 5—8'.

Capitulum hardly distinct from peduncle, globular, with low and indistinct carinal crest. Orifice not protuberant, short and narrow. No scuta; the place these should occupy indicated as smooth patches of oval shape. The cirri of the 5th and 6th pair shorter than the foregoing ones. Inner ramus of the cirri of the 5th and 6th pair slightly shorter than the outer rami.

The capitulum of this species in some of the specimens almost insensibly slopes into the peduncle (Pl. IX, fig. 5), in others it is distinctly separated from the peduncle by a contraction. Its shape is globular, with the carinal margin strongly bowed; the orifice is narrow and relatively short, and is straight seen from the side; the occludent border beneath or behind the orifice is slightly convex. Along the carinal margin is seen a very low crest which continues along the peduncle. There is a reticulation of delicate striae all over the surface and deeper wrinkles occur near the orifice, being placed at right angles to its main axis. Neither striae nor wrinkles occur at a place of oval shape under or in front of the orifice, on both sides of the capitulum: these smooth places or patches probably represent the so-called horny scuta of some of the other species.

The peduncle is very short, its general shape is cylindrical. The surface is indistinctly ringed; on the one side (in the specimen figured, the left) the base of the peduncle forms a chitinous expansion with which the little body is attached to the surface of one of the valves of the *Lithotrya*.

Size. The length of the capitulum and the peduncle together is, in the largest specimen, about 4,5 mm., the length of the peduncle being about 1 mm. The other specimens are considerably smaller; the largest has been used for the description of the shape of the capitulum, as well as of the structure of the animal's body. It was not furnished with egg-lamellae, but to judge from the state of development of the ovary, it was full-grown, mature or nearly so.

[1] A figure is given in "Illustrations of the Zoology of the R. I. M. S. S. Investigator", Calcutta, 1907. I think ANNANDALE's *A. xenophorae* and my *A. intermedia* are different species. (Note added during press).

The study of the structure of the animal contained within the capitulum has yielded the following results:

Mouth. Labrum distinctly bowed with a row of about 30 rounded chitinous knobs at the place of the teeth and with a series of delicate hairs inserted in front of the knobs. Palpi short, broad at the base, conical with several bristles along the outer margin and a tuft of such bristles at the tip.

Mandibles (fig. 6) with three teeth and the inferior angle. The second and third tooth and the third tooth and the inferior angle at nearly equal distances from another, the first and second tooth at twice the distance of the other teeth. The inferior angle is slightly raised at its extremity and terminates in a not very pointed tooth, much ressembling the other three teeth. Very small, sharp spines occur along the upper edges of tooth 2 and 3, as also along the upper edge and along the under edge near the extremity of the inferior angle. Near the outer edge the surface of the mandible is furnished with numerous hairs which are placed in groups of two or three; some hairs reach over the free edge, numerous others are planted along the inferior margin.

Maxillae (fig. 7) with three strong spines above a rather broad notch and the part beneath the notch slightly produced. Between the three upper spines, of which the first is by far the strongest, a few delicate hairs are planted, one of which is distinctly serrated. In the notch are a few short hairs and about 10 rather strong spines, arranged in a double row along the lower part. Hairs in groups of two or three on the surface near the free edge; a row of stronger hairs along the inferior margin and a few hairs forming a group at the upper margin near the insertion of the upper spine. Apodeme rather long.

Outer maxillae short, rounded at the extremity with a dense tuft of spines near that extremity and along the inner side. Between the longer spines are inserted numerous very delicate hairs.

Cirri short and nearly straight, hardly curved. First pair very short, 2nd—4th pair longer than the others, 5th and 6th pair considerably shorter than the foregoing ones.

First pair placed close to the mouth, at a little distance from the second, with short and rather unequal rami of 5 and 6 segments. The shorter ramus has the first segment indistinctly divided into two segments and the four following ones decreasing in dimension. Hairs on the segments numerous, increasing in strength from the first to the fifth segment; about the middle of its length each segment has a distinct transverse row of longer hairs. The last segment bears two claw-like spines at the tip. The longer ramus is considerably broader; it has six distinctly separated segments, decreasing in dimension from the 1st to the 6th. The lower are densely covered with hairs, the distal in a less degree. The last segment has four strong spines at the tip; these are not quite so strong and a little less curved than those at the tip of the shorter ramus.

The 2nd to 4th cirrus has nearly equal rami of 9 to 10 segments. The shape of the segments is almost quadrangular, with the exception of the first segment of each ramus, which is from 2 to 3 times as long as broad and of the last segment, which is small and rounded at the tip. The bristles form transverse rows near the extremity of each segment and a tuft

of more delicate bristles are placed about the middle of the slightly swollen, anterior margin of each segment. Of those arranged in a transverse row, to begin with the 4th or 5th segment, two or three are much thicker and stronger and have the shape of claw-like spines.

The 5th and 6th cirri are shorter than the foregoing ones, the 6th being not inconsiderably shorter than the 5th, the latter equalling about $^2/_3$rds the length of the cirrus of the 4th pair. The rami of the 6th pair (fig. 8) are slightly unequal and have respectively 7 and 9 segments. On the posterior margin of each segment, near the extremity, a group of spines are planted which correspond with the stronger ones of the transverse rows of spines of the segments of the 2nd—4th cirrus. From the 4th to the 8th segment two of these spines are claw-like and strong, the one, however, more so than the other. The last segment bears two claw-like spines at the tip.

Caudal appendages (fig. 8) thin, having five tapering segments, and being a little longer than the pedicels of the sixth cirrus. Delicate hairs are planted on the extremity of each segment, the last segment bearing on its summit a tuft of slightly longer hairs, the longest of which is nearly equal to the length of the segment itself.

Penis (fig. 8) rather thick, with the terminal part narrow and conical towards the extremity. The middle part is distinctly ringed. A few delicate hairs are scattered over its surface, a tuft of such hairs being planted close by the tip. On each ring of the annulated middle part a transverse row (fig. 8′) of short, broad spines of very peculiar shape is planted. They look like little hands with extremely short and pointed fingers. The number of these peculiar appendages is largest on the broadest segments, their maximum number upon one segment being 15.

The specimens of this species were found attached to the valves, partly to the outer, partly to the inner side of *Lithotrya nicobarica*. I observed from 2 to 7 specimens — most of them very small ones — attached to one *Lithotrya*. They must be a nuisance to the animal, especially when they are attached to the inner side of the valves; they feed, in all probability, on the same planktonic matter which the *Lithotrya* is trying to get hold of.

The *Lithotrya nicobarica* was collected at:

Stat. 225c. November 8, 1899. 2700 m. N. 185° E. from Southpoint of South Lucipara Island. Reef-exploration. Bottom: stone.

A small specimen of the same species was found attached to a specimen of *Lithotrya conica* n. sp. collected during the "Siboga" expedition at "Kur-Reef", a very small one to one of the specimens of *L. truncata*, collected at Haingsisi, Samau Island, Timor.

Observation. I think that this species comes close to *Alepas quadrata* Aurivillius. I consider and describe it as different, partly because the general shape is quite different, partly because it seems to live under quite different conditions, partly because the structure of the appendages of the animal's body does not agree with that of the species of Aurivillius. The short and straight cirri composed of 8—10 segments only are peculiar to the present species. The interesting small spines which cover the surface of the penis occur most probably also in *A. quadrata*. Aurivillius says (l. c. p. 32) that this organ is "hie und da mit rückwärts gerichteten Börstchen versehen". Perhaps there exists a certain relation between the one or both species and *Alepas malaysiana* described of late by Annandale.

4. *Alepas ovalis* n. sp. Pl. IV, fig. 17 and 18.

A single specimen of a species of the genus *Alepas* different from the known species was taken by H. M. S. "Siboga" at Station 267. According to the label the specimen was found attached to the spines of *Porocidaris elegans*, on which the specimens of *A. morula* were also found. It differs from that species at first sight 1^0 by its form which is more regularly rounded oval; 2^0 by the absence of the tubercles on the surface; 3^0 by the somewhat larger orifice of the capitulum; and 4^0 by the shorter and more cylindrical peduncle. When I received it, the specimen was no longer attached to the Echinid-spine (as was the case with the specimens of *A. morula*); so that the peduncle may have been longer in reality.....

The shape of the capitulum, the not very distinct crest at its carinal edge, the way in which the capitulum is separated from the peduncle can be best judged, I think, from the figures 17 and 18 of Pl. IV. The length of the capitulum and the peduncle together is nearly 11 mm., the capitulum alone measuring about 8 mm. Scuta absent or entirely hidden under the chitinous membrane.

The species to which this specimen belongs has no doubt a certain resemblance to *A. japonica* Auriv., but I do not believe it can be identical with it. Only dissection and full investigation of the parts of the mouth, the legs etc. might settle this — but I feel unable to do so without destroying the specimen.

The specimen was taken at:

Stat. 267. December 20, 1899. Lat. 5° 54′ S., Long. 132° 56′.7 E. Depth 984 m. Bottom: grey mud with a brown upper layer.

As I have pointed out already in the introduction to the genus *Alepas*, of all the known species this form, next to *A. Lankesteri*, inhabits the greatest depth. This is also one reason why I think identity with *A. japonica* highly improbable.

4. *Alepas tenuis* n. sp. Pl. IV, fig. 19.

Still another species of the genus *Alepas* is represented in the collection of H. M. S. "Siboga". There is again only one specimen and it is very small — whether full-grown or not I am unable to decide. It resembles *Alepas Lankesteri* Gruvel to a certain extent — yet it is much smaller and the resemblance might on closer examination turn out to be superficial only.

Like *Alepas Lankesteri* the capitulum is devoid of scuta and furnished with a continuous ridge extending from the orifice to the peduncle. I have figured the little animal (Pl. IV, fig. 19), the total length of which is 6,4 mm.; the figure will, I hope, enable this form to be recognised, should it again be found.

It was taken at:

Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand.

General Remark. I do not think it a good custom in general to describe such forms as novae species, of which it is impossible to give a full description for want of material. When discussing the geographical distribution and the bathymetric range of the known species of the

genus, for the sake of convenience names were also given to the two last mentioned forms. The number of known species of the genus *Alepas* not being very large and the species more or less recognisable from their outward shape, no confusion will arise I hope from my naming these two forms, deviating in so doing from what I consider a very good rule in general.

Genus **Microlepas** n. gen.

Capitulum without valves, with rather large and prominent aperture. Mandibles and maxillae foliaceous without teeth or stronger spines. Cirri of the first pair one-jointed without rami, those of the 2nd—6th pair with uniarticulate rami of very unequal size.

This cirripede resembles at first sight a species of *Alepas*; it cannot be considered as belonging to that genus, however, owing to the structure of its mouth-parts and cirri. Only one species of the genus is known; to give a more detailed description of the genus is useless and even dangerous, as it is quite impossible to decide what characters have generic and what specific value only. The only specimen of the species of this genus which is at my disposal was found by Prof. Max Weber attached to one of the spines of *Diadema saxatile* (Linn.) at Station 53. I propose to call the species:

1. *Microlepas diademae* n. gen., n. spec. Pl. X, Fig. 8—16.

Capitulum blending insensibly into the short peduncle, aperture oval, large, situated at some distance from the slightly produced summit. Peduncle indistinctly wrinkled.

Capitulum elongate-oval, moderately flattened (Pl. X, fig. 8); its summit bluntly pointed, forming a small conical excrescence in front of the orifice. The membrane composing the capitulum is thin, flexible, smooth on the left, longitudinally wrinkled on the right side. Orifice large, broadly oval with darker, brownish coloured margin. Peduncle short, blending insensibly into, but a little narrower than the capitulum; surface with an indication of transverse wrinkles.

The colour of the capitulum is light greyish-brown, but it has been in spirit for several years. The size is, including the peduncle, 5,6 mm.

The little animal's body was hanging out of the orifice of the capitulum, it was distorted and in a somewhat deteriorated condition. A piece of the sack or mantle was loosened from the inner side of the capitulum and also forced out of the orifice and a cluster of eggs was attached to this piece of mantle. The body was to some extent covered by these parts, so that I only succeeded in making out its structure by loosening it from the capitulum.

I found the mouth not very prominent and placed at a little distance from the first pair of cirri. The prosoma was well-developed, its muscles rather strong, the part of the body representing the thorax small, rather rudimentary.

Of the parts of the mouth, I found the labrum not distinctly bullate or swollen with a straight crest without distinct teeth and with small triangular palpi. The mandibles and the maxillae were relatively large, and extended beyond the labrum and the outer maxillae; they were of a very peculiar shape.

The mandibles (fig. 9) have no teeth but a smooth and rounded edge, along which are numerous very delicate hairs in several rows. Its inferior angle is acuminated and ends in a slightly stronger bristle, which however can hardly be called a spine.

The maxillae (fig. 10) have the edge also rounded, without steps separate from one another by notches and without stronger spines at the upper corner. Along the rounded edge numerous delicate hairs are inserted in several rows; the lowest corner has two slightly stronger bristles and another is seen at a little distance from it. A rather stout and not very long apodeme is attached to the maxilla. Both maxilla and mandible are thin and delicate, their extremities reaching beyond the tip of the mouth on the whole.

Outer maxillae (fig. 11) represented by very small rounded structures with delicate hairs along their inner surface and at the tip. A group of apparently stronger hairs on a little rounded excrescence near the summit — these hairs, however, were all broken off.

First pair of cirri (fig. 12) quite rudimentary, represented by a one-jointed conical limb with a few short hairs at the tip.

Second-sixth cirrus (fig. 13—15) of about the same structure: each consisting of a two-jointed pedicel and two rami, each of which is represented by a single segment only, the one however about twice as long and more than twice as broad as the other. The cirrus of the second pair has the lower segment of the pedicel shorter and the upper longer, the third cirrus has about the same structure; in the 4th—6th cirrus, however, the two segments of the pedicel are of about the same length. In all the cirri a number (4—6) of stronger hairs are planted on the pedicel at the base of the segment which represents the stronger ramus, and another group of even longer and stouter hairs at the base of the more rudimentary ramus. Both rami bear at their rather broad, truncated extremity a dense tuft of very thin and delicate hairs which are irregularly curled, of very unequal length but altogether rather long. As a rule a separate group of hairs is inserted at or near the extremity of the stronger ramus, near its extremity. Such a separate tuft of slender hairs is also observed on the inner side near the extremity of the segment representing the smaller ramus.

The cellular (plasmatic) contents with muscles and nerves have shrunk from the chitinous surface of the legs of the animal, due probably to the alcohol in which it was kept. The hairs are seen through the chitinous covering standing with their plasmatic contents in communication with the contents of the leg itself. The contents are distinctly denser and darker coloured near the extremity where the hairs seem to take their origin.

Caudal appendages not observed, most probably wanting.

Penis (fig. 15) rather broad, short, not extending beyond the extremity of the cirri of the 6th pair, truncated at the extremity where it bears a tuft of short hairs. Numerous very short hairs scattered over its surface.

The little animal was sexually well-developed and provided with ovigerous lamellae, which, however, had not the shape of leaves but rather of clusters of irregular shape in which the eggs formed several layers. As I described above, one of these clusters had been forced out of the sack of the animal, the other being still seen in the cavity. The eggs are numerous and small. They have an elongated form, at least in the highly developed

condition I observed them in (fig. 16). Their size was: long 0,26—0,28 mm., shortest diameter about 0,1 mm.

This species is represented by one specimen only. It was found attached to the extremity of spine of *Diadema saxatile* (Linn.) collected by H. M. S. "Siboga" at:

Stat. 53. April 21—22. Depth up to 36 m. Bay of Nangamessi, Sumba.

I was at the end of the description of the pedunculate Cirripedia collected by H. M. S. "Siboga" when I received this small and very curious form. I consider it so very interesting, that, though it is represented by one specimen only, I describe it as a new species. This compels me, however, to create for it a new genus also, as it is perfectly impossible to range the species under one of the existing genera. I am sorry to say that in consequence of its being represented by only one specimen, which is moreover slightly deteriorated, it has not been possible to study this new form in such detail as could have been desirable. Having dissected numerous and very small forms of Crrripedia, I think it hardly possible that I should mistake another part for a mandible or should overlook a pair of cirri, but the very peculiar shape of these parts in the present animal have, I must confess, given me great trouble. I should have prefered, before publishing a description, to control the details of its structure with the aid of a richer material — I have tried in vain, however, to procure such.

The outer shape of the capitulum of this new form is much like that of *Alepas*. I could not study the muscles of the peduncle in order to see whether they run up from the peduncle and surround the capitulum — as is the case in *Alepas* — without quite destroying the type. But I think it probable that there is correspondence in this regard also between the two genera. In *Alepas cornuta* the inner rami of the 5th and 6th cirri are rudimentary, as was discovered by Darwin, and in some other species of the same genus a similar inequality has been observed. Gruvel calls this the atrophy of one of the rami: the cirri of *Microlepas diademae* show this atrophy in both rami and to a much greater extent! The cirri of *Anelasma* have, according to Darwin, a shapeless and rudimentary appearance, being quite spineless, and not articulated. Yet their anterior faces are more or less distinctly lobed, so that prominent steps can "be counted, manifestly representing so many segments", as Darwin says. Though the cirri of *Microlepas diadema* are furnished with long hairy bristles, they are in a much more rudimentary condition than those of *Anelasma*. In the genus *Gymnolepas*, as described by Aurivillius, all the cirri have the rami of the same length, composed of 7 segments only; these rami in all the cirri are almost of the same length as their pedicels — whereas those of the 2nd—6th pair in all other Lepadids are longer than those of the first pair and as a rule twice as long as their pedicels or even longer. Aurivillius compares his new genus with *Anelasma* and says that a reduction of all the cirri has occurred in these two genera. There can be no doubt, I think, that a much more considerable reduction has occurred in *Microlepas diademae*!

The parts of the mouth show an analogous reduction. So far as I know, all pedunculate Cirripedia have mandibles with at least two, as a rule three or four, in some genera more

(to ten), strong teeth in a single row; they are always by far the strongest pair of parts in the mouth, being generally about double the size of the maxillae. Now the mandibles of *Microlepas diademae* have no teeth whatever, the inferior angle only being furnished with a somewhat stronger spine than those which are planted along the free edge; further, the mandible of this Cirriped can hardly be said to be larger than the maxilla. The latter in all other Cirripedia has larger spines at the upper corner and numerous more or less strong spines along the edge: in *Microlepas diademae* it has the edge regularly curved and furnished with several rows of extremely delicate hairs — its inferior angle showing a slightly stronger spine-like hair, another being inserted at a little distance from that angle.

The extremely rudimentary condition of the first pair of cirri and the fact that caudal appendages are wanting complete the description of a pedunculate Cirriped, which so far as the structure of the body with its articulate limbs is concerned, must be considered as one of the most reduced at present known. This reduction concerns the body of the little animal only — the capitulum gives at least the impression of being that of an ordinary *Alepas*. It is of course very difficult to understand how such an exceptional reduction has taken place and the circumstance that I am quite ignorant of the mode of life of *Diadema saxatile* makes it perfectly hopeless to seek for an explanation. I do not know, for instance, what position the club-shaped spine, at the tip of which our *Microlepas* was placed, occupies on the body of the Echinid, whether this spine is highly moveable etc. There is every reason to think, that the reduction of the limbs, parts of the mouth and cirri, is in accordance with the nature of the food and the way in which this is grasped by the little animal — I do not know, however, what difference there is between its prey and that of other Cirripedia. We are therefore unable to explain the physiological side of the phenomenon; its morphological importance lies in the high degree of reduction and in the fact, that — so far at least as our present knowledge goes — no real intermediate forms can be said to occur which could bridge over the gap between an ordinary *Alepas* and this cripple-like form.

Genus **Ibla** Leach

The Cirripeds of the genus *Ibla* are characterized by the absence of calcareous matter in the valves and spines of the peduncle, by the presence of four valves (two scuta and two terga), as also by the fact that (in the one of the known species) the sexes are separated, or that (in the other species) the "masculine efficiency is aided by one or two complemental males" (Darwin).

Of this genus two species were known to Darwin in 1851. Since that year no new species have been described, nor have the original species of Darwin been often met with. In his list of 1897 Weltner[1] mentions the occurrence of *Ibla Cumingi* Darwin in the Red Sea, in the neighbourhood of the Philippines and at Zamboanga (also Philippines), and of *Ibla quadrivalvis* (Cuvier) at Van Diemensland. Of the latter species Gruvel[2] found numerous specimens

[1] Weltner, W., Verzeichnis u. s. w. Archiv f. Naturg. 1897, Bd I.

[2] Gruvel, A., Révision des Cirripèdes appartenant à la collection du Muséum d'histoire naturelle. Nouv. archiv. du Muséum (4), IV, 1903.

(full-grown and young) in the collection of the Paris Natural History Museum: they were from "Port du Roi Georges" (King George Sound, West-Australia?), from Djibouti, from the east-coast of Madagascar and from Mascatte. In both papers published by GRUVEL [1] he treats the genus *Ibla* rather extensively, but any newer literature on this genus seems not to be known to him either.

During the cruise of H. M. S. "Siboga" specimens of *Ibla*-species were collected at different places in the Malay Archipelago. They belong to two different species: *I. Cumingi* and another which is different from the two known from DARWIN's Monograph. It comes near to *I. Cumingi* and is unisexual like that species; like both hitherto known species it is a true littoral form. All the specimens collected by the "Siboga" were met with during reef- or shore-exploration.

To distinguish the species I give the following table:

Ibla

1. Hermaphrodite with complemental male (or males). . . . . *I. quadrivalvis* (Cuvier).
2. Unisexual with dwarfed males.
   a. Valves of the female coloured blue along the lateral margins and on the upper interior surface. . . . . *I. Cumingi* Darwin.
   b. Valves without blue margins . . . . . *I. sibogae* n. sp.

1. *Ibla Cumingi* Darwin.

DARWIN found the specimens of this species "invariably attached to the peduncle of *Pollicipes mitella*, in groups of two or three together". The "Siboga" collected *Pollicipes mitella* on two different occasions: at Labuan Badjo (Flores) and in the southern part of Molo Strait. *Ibla Cumingi* was found attached to two of the specimens from the latter place.

The specimens are not very numerous, nor are they very large. They not only show the blue margins of the valves, but the structure of the body, of the parts of the mouth, the cirri and the caudal appendages corresponds with DARWIN's description.

In the collections made during the "Siboga's" cruise there is another group of specimens which I consider belong also to this species. They were taken however from the reef in Palos-Bay, Celebes, and were not found attached to the peduncle of *Pollicipes mitella*. Their valves have blue margins and the structure of the parts of the mouth and of the limbs is much the same as in the specimens found at Labuan Badjo.

(WELTNER (l. c.) mentions the occurrence of this species in the Red Sea; as *Pollicipes mitella* is not known to occur there, this seems to be another instance of this species not living "invariably" attached to the other Cirriped.)

In all the specimens I dissected I found, at the place indicated by DARWIN, a little male. DARWIN's description of these males is detailed and on the whole correct so I need not repeat it here. A full description of the (complemental) males of *Ibla quadrivalvis* is given moreover

[1] GRUVEL, A., Cirripèdes des expéditions scientifiques du "Travailleur" et du "Talisman". Paris, 1902.

by GRUVEL[1] and in most regards this holds good also for the male of *Ibla Cumingi*. There is however one detail which I found different from DARWIN's description. DARWIN speaks of an imbedded portion of the peduncle of the little male passing obliquely through the chitine membrane and corium lining the sack of the female, and running along amidst the underlying muscles and inosculating fibrous tissue, attached to them by cement at the extremity. I have always found the little male attached to the wall of the sack by means of a disc of cement, but I could not observe that it passed through that wall. I think that the description given by GRUVEL, where he says (for *Ibla quadrivalvis*) that the mantle (DARWIN's "sack") sometimes forms a proliferation, through the centre of which passes the extremity of the peduncle of the male, explains what has been observed by DARWIN. According to GRUVEL the tubular part of the male "s'enfonce dans le manteau de l'hôte". This means, I think, that the mantle forms an invagination to receive the extremity of the tubular part, not that this passes through it to meet with the muscles of the female's or hermaphrodite's peduncle.

This species was collected at the following places:

Stat. 51. April 19, 1899. Shore-exploration in Madura Bay and other localities in the southern part of Molo Strait. A few small specimens attached to *Pollicipes mitella*.

Stat. 86. June 18—19, 1899. Reef-exploration Dongala, Palos Bay, Celebes. Specimens loose, i. e. not attached to *Pollicipes mitella*. (N.B. No specimens of *Pollicipes* were collected at Station 86).

2. *Ibla sibogae* n. sp. Pl. IV, fig. 20—22. Pl. V, fig. 1—8.

Female. Valves of a uniform dirty brown or red brown colour — no blue, neither along the lateral margins nor on the upper interior surface. Spines on the peduncle without blueish brown rings. Caudal appendages only slightly longer than the pedicels of the sixth cirrus; rami of the first cirrus unequal by 2—5 (as a rule 4) segments.

Male. Closely resembling that of *I. Cumingi* Darwin.

This species is unisexual like *I. Cumingi* Darwin, which it also resembles in many other regards. The absence of the blue colour, together with a few slight differences I perceived in the structure of the parts of the mouth, the cirri and caudal appendages, as also the circumstance that *I. Cumingi* lives attached to *Pollicipes mitella* as a rule, made it necessary to consider the present form as a different species. Later investigation of a richer and if possible quite fresh or living material of both forms may show however that they are not specifically different but only represent two varieties of one species.

Female

The animals are somewhat variable in shape, that part of the peduncle to which the capitulum is attached and which as a rule is considerably broader than the inferior part, sometimes forming an abrupt swelling and sometimes quite insensibly sloping into the inferior part. In other specimens there is a distinct constriction beneath the broader part, almost in the middle of the

[1] GRUVEL, A., Cirripèdes des expéditions scientifiques du "Travailleur" et du "Talisman". Paris, 1902.

peduncle. In a few — probably younger — specimens the peduncle is nearly cylindrical or compressed cylindrical.

The colour of the animals is sometimes red-brown (e. g. in specimens from the Bay of Bima) sometimes dirty brown (specimens from Kwadang Bay, Pajunga Island, for example). The swollen part of the peduncle is as a rule darker coloured than the inferior part, and darker also than the valves. In some of the specimens the valves have slightly darker margins, the dark colour having however a blackish-brown, not a blueish tinge.

The spines or horns of chitin which thickly clothe the superior part of the peduncle are "nearly cylindrical, irregularly curled, and nodose or slightly enlarged at intervals: the apex smooth and pointed; the exterior surface longitudinally and finely ribbed" — exactly as DARWIN says they are in *I. Cumingi*. But whereas he says, that those of the latter species are "ringed with pale and dark blueish brown, which on pressure becomes slightly opalescent with pale blue and fiery red", those of *I. sibogae* never show a trace of blue and are always yellow- or brownish-yellow coloured.

The shape of the valves corresponds in general with the description given by DARWIN of the valves of *I. Cumingi*. The tips of the valves, of the terga especially, are often broken off and their exact shape is difficult to make out in consequence. The scuta have the outer surface much more plainly marked by zones of growth than the terga. The valves are longitudinally ribbed, the delicate ribs seem to correspond to those of the horns on the surface of the peduncle in distance from one another as well as in delicacy.

Fig. 21, A and B of Pl. IV show the internal surfaces of the valves after being cleaned with caustic potash. When not separated the scutum (A) at the outer side overlaps a portion of the tergum B, so that the scutal margin of the tergum (from *c* to *d* in the figure) reaches as far as the pointed line to the left side of A. What DARWIN calls the growing or corium-covered surfaces of the valves, the parts covered with epithelium, are easily to be distinguished from the free horn-like portions. In the scutum this part is triangular but it is not of the same length as the horn-like portion, as DARWIN says it is in the scutum of *I. Cumingi*, but considerably shorter. In the tergum the growing part is of an irregular diamond shape. The chitinous structure of both valves is very characteristic: the figures 21 A and B try to give an idea of it. The crest running from the summit of the triangular portion to the tip of the scutum, with the short lateral branches directed towards the occludent margin of the valve, seems slightly more developed in *I. sibogae* than in *I. Cumingi*.

The shape of the body and the structure of the limbs in general is the same as with *I. Cumingi*. As in that species the chitinous covering of the prosoma bears very delicate, pointed hairs. I wish to point out the following, perhaps not very important differences for the parts of the mouth and the other limbs.

Mouth. The labrum has from 3—7 small nob-like teeth: in younger specimens 3 or 4 only, in one of the older ones 6, in another 7. Between these nobs short and extremely delicate hairs are planted. DARWIN says that there are no teeth on the crest of the labrum in *I. Cumingi* and that the same part in *I. quadrivalvis* is "a little roughened with minute points". Now the teeth of the labrum of *I. sibogae* are hardly more than minute points; I may add

that I observed them also on the crest of the labrum in one of the specimens of *I. Cumingi* from Station 86 (Pl. IV, fig. 22).

The palpi of the labrum are small, rounded at their ends; the hairs on the palpi form a not very dense tuft at the extremity, those on the palpi of both sides hardly touching one another when in the natural position. The outer margin bears a row of extremely minute hairs.

Mandibles. In one of the specimens from Station 47 the upper edge of the second tooth was not pectinated. The inferior angle is only slightly produced in all the mandibles I investigated; it is pectinated as figured (fig. 22*a*).

Maxillae (Pl. V, fig. 1). Edge very indistinctly indented; it supports, besides the three upper large spines, a number of moderately strong spines, which can hardly be divided into stronger and more delicate ones. Maxillae small, apodeme short.

The shape of the outer maxillae (fig. 2), of the conical prominence clothed with bristles and coloured purple lying over the infra-oesophageal ganglion between the bases of the first pair of cirri, corresponds exactly with DARWIN's description of the same parts in *I. Cumingi*.

Cirri. The first cirrus has the rami unequal in length by from 2 to 5 segments, by about two segments in *I. Cumingi*, according to DARWIN. I dissected in all six specimens of *I. sibogae* and I found the following numbers of segments for the first cirrus: 21—17, 20—16, 17—14, 17—13, 17—12 and 14—12. These numbers show greater variety than is the case in most other Lepadids.

(In a specimen of *I. Cumingi* I found a difference of 5 segments in the first pair of cirri, in another of 3 segments).

The other cirri conform in general to DARWIN's description of *I. Cumingi*. Investigating carefully the arrangement of the bristles on the segments of the sixth cirrus, I found very often on the anterior surface not three pairs of spines, the lowest pair being minute, but four pairs, three of which were stronger, the fourth very delicate. A number of segments showed this arrangement, others on the same cirrus the three pairs as described by DARWIN for *I. Cumingi*. (On the 6th cirrus of a specimen of *I. Cumingi* collected at Station 86 I also found four pairs of bristles on some of the segments — however, the number of segments showing this arrangement was very small).

The caudal appendages have from 17 to 13 segments. The upper segments which in *I. Cumingi* "are slightly constricted round the middle, so that they resemble in a small degree an hour-glass" (DARWIN), in *I. sibogae* do not show the hour-glass shape as a rule. In some specimens the two last joints show a trace of that peculiar shape, which I found distinctly developed in the last six segments of the caudal appendages of specimens of *I. Cumingi*. As in this species the caudal appendages of *I. sibogae* are as long as or slightly longer than the pedicels of the sixth cirrus.

The egg-lamellae are not very large, nor is the number of eggs in each lamella: a lamella contains one layer of eggs only, in that of a medium-sized specimen from Station 61 I counted about 240 eggs. In each lamella the eggs are kept together by an extremely delicate and clear membrane, which surrounds each egg as a capsule. At one place the margin of

the membrane forms an irregularly folded thickening by means of which the lamella is attached to the wall of the sack and which therefore represents DARWIN's "ovigerous frenum".

The eggs are not spherical (as those of *I. quadrivalvis*, according to DARWIN) but oval, the proportion of the longest to the shortest diameter being in one case as 40 to 34, in another as 40 to 30. The size of the eggs was found to be different in different specimens: the larger females probably producing larger eggs. The eggs of a small female from Labuan Badjo (West coast of Flores) measured 0,14 × 0,1 mm.; development was only beginning. A larger female taken from the corals of the island of Billiton contained eggs of 0,21 × 0,16 mm.; these eggs showed the larva nearly quite developed, with the black Nauplius-eye, the three pairs of legs etc.

(DARWIN does not give the size of the eggs for *I. Cumingi*; one of the specimens of that species collected in Molo Strait was furnished with egg-lamellae. The eggs had the same shape as those of *I. sibogae*. Their greatest and shortest diameters measured 0,18 and 0,13 mm.)

The size of the specimens is as variable as their shape. The larger specimens from the different Stations have a length from 17,5—10 mm. The longest specimens are rather narrow: thus the specimen of 17,5 mm. in length is nowhere broader than 4 mm. and its breadth measures 2,3 mm. where narrowest. The stoutest specimen of all had a length of about 14 mm., its breadth being 6,5 to 7 mm. in the upper part and in the inferior part of the peduncle it was nowhere narrower than 5 mm.

A few of the specimens are attached to little pieces of stone, in one case two, in another four being situated on different sides of one stone. A few were found attached to a piece of broken shell of a Balanid. Most of them, however, are quite loose. The inferior extremity of the peduncle forms a flat disc in numerous specimens, and it is with this disc that the animal is cemented to the stones or other objects on the bottom of the sea.

Males

I opened a dozen specimens of the females of *I. sibogae* and found with a few exceptions only one or two males attached to the wall of the sack. They were of very different size and development: as a rule they were small and immature, in two cases I found them relatively large and undoubtedly full-grown. But even in the latter cases I found a considerable difference in size between the two males attached to the same female. The figure 20 of Pl. IV shows two larger males as they were found *in situ*; whereas the larger has a length of about 3,5 mm., the other measures only 2,5 mm. The other full-grown couple of specimens showed about the same proportions and dimensions.

The immature or not quite mature specimens varied in size from 1,1 to 1,4 mm., one of them measuring only 1,8 mm. The latter showed the testes in nearly quite developed condition. Males of 1,4 mm. were in several cases found attached to the sack of a female which was provided with ovigerous lamellae.

The number of males attached to a female is as a rule two; they are found attached to different parts of the interior wall of the sack, but seldom at the place where DARWIN found the little male of *I. Cumingi*, viz. "in a nearly central line, at the rostral end". I found them

as a rule more to the left and at the bottom of the sack. When two were present (Pl. IV, fig. 20) they were so placed that the anterior portion of the one touched the posterior end of the other. I never observed that a much constricted part of the males passed through the skin (sack or mantle) of the female; there is as a rule a thickening of cement round about the base of the peduncle. The extremity of the peduncle with its cement-ducts passes through this cushion of cement, but I never observed that it also went through the wall of the sack (or mantle).

The figures 3—8 of Pl. V are drawn from a male of 3,5 mm. DARWIN calls the part in front of the oblique fold the thorax, the rest the peduncle of the animal. The thorax supports two pairs of rudimentary cirri and, more to the so-called ventral side, the parts of the mouth. The labrum is very broad with a nearly straight edge and small palpi. The latter have a few short bristles or hairs at their pointed extremity. The mandibles have three teeth, more diverging than in the females; the inferior edge is quite undeveloped: a mere nob with a rudimentary point or spine at the extremity. The maxillae show the three upper spines and two more spines at the inferior end of the edge separated by a notch from the upper spines. The two stand at a little distance from one another and are considerably shorter than the upper spines, two of which are again stronger than the third which is planted between the two. The outer maxillae are relatively large; they show a row of small bristles along the curved outer side, they have the so-called olfactory orifices at the end of flat tubular processes, exactly as in the female and just as already described by DARWIN.

The two pairs of limbs which represent the cirri have one ramus only. DARWIN concluded from the position of the excretory orifices (genital porus and anus) that these cirri answer to the fifth and sixth pair in other Cirripedes — but this view is not supported by the circumstance, that I observed a rudimentary capsule in the basal segment of the first pair (in a small specimen of 1,4 mm.), much resembling the so-called auditory sack. Hence I would conclude that the first leg represented the first cirrus of an ordinary Cirriped.

These legs vary much in size and are often represented by one- or two-jointed rudiments only, either on one or on both sides of the same individual. I found them relatively large, the first pair composed of 5, the second of 6 segments, in the 2,5 mm. long specimen which accompanied the 3,5 mm. male of figure 3. In the largest of the two (the front part of which is figured Pl. V, fig. 4) the basal segment which according to DARWIN represents the pedicel of the cirrus, and which is beautifully pigmented with brownish purple, was very large in the one cirrus as well as in the other. The anterior cirrus which was smaller than the posterior and planted a little lower down on the thorax had four segments besides the basal one; the posterior cirrus or leg had the same number, the terminal segment being moreover indistinctly divided into two segments. Little brushes of spines are planted on the edges of the segments, slightly more prominent towards the dorsal side.

In the fig. 4 of Pl. V I have indicated the free edge of the thorax as seen through the basal segment of the last cirrus. Following that edge behind the last pair of cirri we see that it forms a round excrescence: a rather stout papillus, which projects freely at the so-called dorsal side of the body. This papillus most probably represents the penis — I would say so with greater emphasis, if I had been successful in discovering the genital porus at its surface

or free extremity — but this is not the case. In the other larger (nearly full-grown) specimen I have investigated, I did not observe this papilla or, better perhaps, excrescence. In two of them I observed the two closely approximate, flattened points mentioned by DARWIN as being present between the bases of the last cirrus. These are considered by DARWIN as the caudal appendages in an extremely rudimentary condition; close outside these rudimentary points on a slight swelling is the anus, according to DARWIN. I need hardly point out that the excrescence as figured by me would not be called a slight swelling by DARWIN. I may add that I could distinguish a small porus behind this excrescence, between it and the free projecting part of the oblique fold — whether this porus really represents the anus I have not been able to make out.

It is not the place here to enter into more details with regard to the anatomy of this little male. With the material at my disposal it would hardly have been possible to penetrate much farther into the mysteries of its structure than DARWIN did by dissection and GRUVEL (l. c.) by applying the more modern method of cutting sections. There are several points of great interest connected with these males — I think they will offer a very fruitful subject of research to the zoologist who studies their anatomy as well as their biology at the place where he finds them on the coral-reefs.

An important point yet to be made out is their metamorphosis. They pass no doubt through a Cypris-stage; but the youngest stage observed by GRUVEL in all essential points — but for its immatureness — resembles the grown-up male. DARWIN observed the larvae of *I. quadrivalvis* in this stage and distinctly saw "all the essential points of structure in the larvae of other Cirripedes at this stage" but he did not observe the metamorphosis itself.

Another essential point would be to determine whether or not these little males feed independently. DARWIN supposes that the male *Ibla* seizes its prey with its mouth through the movement of its long flexible body and I cannot understand how it would do otherwise! But GRUVEL seems to admit that the male lives parasitically on the female: derives its nutriment from the much bigger female. He came to that conclusion from the fact that the wall of the stomach is not furnished with calyciform cells, that he could not find a trace of digestive glands and that the stomach of the specimens he investigated did not contain food. But taking into consideration the perfectly well-developed mouth parts, the long oesophagus, the rather large stomach I think it difficult to share GRUVEL's opinion in this regard. How could they take nutriment, if not with their mouth or digest it if not with their alimentary canal? The body and all its appendages are covered with chitin; the only direct attachment to the wall of the female is originally by means of the prehensile antennae, the cement glands situated in the undermost part of the peduncle afterwards secreting quite a cushion or ball of cement which imbeds these antennae. I need hardly say that from that side no food can enter the body of the male.

I found the structure of the cement-glands, -ducts etc., as also that of the male genital organs, the more or less compact globular balls composing the testicles and the double pear-shaped vesiculae seminales in accordance with DARWIN's and GRUVEL's descriptions — these parts may be considered as well known. Perhaps the nervous system is not so well known as yet. GRUVEL describes two ganglionic masses, the one lying dorsally from the alimentary canal and representing the cerebral (supra-oesophageal) ganglion; the other lying ventrally from the

rectum between the two ductus ejaculatorii. He could not make out the chords ("connectifs") uniting the one ganglion with the other, but he admits that such nervous chords exist. I did not observe them either, but I found that a rather large ganglion is situated between the eye and the wall of the stomach, so that the eye nearly rests on or against this ganglion. From this ganglion (the optic ganglion?), which seen laterally as in fig. 3 of Pl. V is oval, but which is broadly heart-shaped when seen from above, two very distinct nerves run, as may be supposed but could not be made out, to the cerebral ganglion.

The "Siboga" collected this species at the following places and stations:

Stat. 19. March 19—21, 1899. Bay of Labuan Tring, west coast of Lombok. On shore.
Stat. 47. April 8—12, 1899. Bay of Bima. On shore.
Stat. 50. April 16—18, 1899. Bay of Labuan Badjo, West coast of Flores. On shore.
Stat. 115. July 9—11, 1899. East Side of Pajunga Island. Kwandang Bay. On the reef.

[N.B. Dr. C. PH. SLUITER sent me, about 1884, specimens of an *Ibla* found by him at Tandjong Pandan (Billiton) on corals which belong undoubtedly to this species.]

Genus **Scalpellum** Leach

Of all the known genera of Cirripedia this is the richest in species. In his Monographie des Cirrhipèdes of 1905 GRUVEL distinguishes in all 93 species of *Scalpellum* — that this number by no means includes all the existing forms is proved by the collection of the "Siboga". It contains 38 species of this genus and 32 of these have not been described before.

This augmentation seems especially considerable, if we take into consideration the relatively small area that has been explored by the Dutch man-of-war: all these new species were collected within the Malay Archipelago.

The number of species of the present genus hitherto known with certainty as occurring in that archipelago was sixteen, viz.:

Sc. villosum Leach. Eastern Seas (DARWIN) (? India, Timor, New Holland).
Sc. trispinosum Hoek. Philippine Archipelago.
Sc. rostratum Darwin. Philippine Archipelago.
Sc. compressum Hoek. Between Celebes and Sangir Islands.
Sc. album Hoek. North of Karakelang, Talaut Islands.
Sc. hirsutum Hoek. West of Batjan, East of Celebes.
Sc. rubrum Hoek. Philippine Archipelago.
Sc. truncatum Hoek. Between New Guinea and Australia, East of Cook Peninsula.
Sc. moluccanum Hoek. South of Ceram.
Sc. australicum Hoek. Between New Guinea and Australia, East of Cook Peninsula.
Sc. distinctum Hoek. North of New Guinea, eastern half.
Sc. indicum Hoek. Kei Islands.
Sc. dubium Hoek. Between New Guinea and Australia, East of Cook Peninsula.
Sc. balanoides Hoek. Kei Islands.
Sc. marginatum Hoek. } North of New Guinea, western half.
Sc. ovatum Hoek. }

As 17th species *Sc. rutilum* Darwin might be added to this list. DARWIN says of this species that its habitat is unknown and adds: associated with *Dichelaspis orthogonia*. As the latter species was collected at three different Stations in the Malay Archipelago, I think it probable that *Sc. rutilum* belongs also to the fauna of this region. H. M. S. "Siboga" collected specimens of three of these species, viz. *Sc. rostratum* Darwin, which was taken at four different Stations and seems to be rather a common form in these seas; *Sc. distinctum* Hoek, taken at two stations and *Sc. moluccanum* Hoek, which was only collected once. The other 35 species have been collected in the Malay Archipelago by the "Siboga" for the first time. Two of these, however, had been observed before outside that Archipelago: *Sc. Peroni* (Gray) was taken by the "Siboga" near the Jedan Islands and was known already from the Swan River, Australia and from Port Western, Bass Straits; *Sc. acutum* Hoek, collected by the "Siboga" at three different Stations in the Malay Archipelago, was taken by the "Challenger" in the Atlantic near the Azores and in the Pacific, near the Kermadec Islands. One of the species of *Scalpellum* collected by the "Siboga" closely resembles a species (*Sc. Stearnsi* Pilsbry) occurring in the Japan Sea: this form is described later as a variety of PILSBRY's species. Thirty two species remain which I have been obliged to consider as new species.

The following list contains the species collected during the cruise of H. M. S. "Siboga", with the places were they were collected and the number of the Station, arranged according to the depth at which they occurred:

Sc. Peroni (Gray)	Jedan Islands	(274)	
Sc. rostratum Darwin	Bay of Bima, Sumbawa; North of Buton; West of Saleyer; South of Timor	47, 204 213, 294	13—94 m.
Sc. pollicipedoides n. sp.	East of Kei Islands	274	57 m.
Sc. aries n. sp.	North of Buton	204	75—94 m.
Sc. uncus n. sp.	South-coast of Timor; Bay of Bima, Sumbawa	285, 47b	34, 296 m.
Sc. imbricatum n. sp.	Near Kei Islands	251	204 m.
Sc. diota n. sp.	Near Kei Islands	251	204 m.
Sc. candidum n. sp.	Near Kei Islands	251	204 m.
Sc. Stearnsi Pilsbry, var. *robusta* n. var.	Near Kei Islands; Madura-Sea West of Makassar; Kei Islands	5, 74 251, 254	204—450 m.
Sc. hamulus n. sp.	Kei Islands	256	397 m.
Sc. polymorphum n. sp.	Kei Islands; North of Sumbawa	256, 45	397, 794 m.
Sc. praeceps n. sp.	Between Halmaheira and New Guinea	159	411 m.
Sc. pellicatum n. sp.	Kei Islands; East of Borneo	256, 94	397, 450 m.
Sc. fissum n. sp.	West of Halmaheira; South of Celebes	137, 212	462, 472 m.
Sc. proclive n. sp.	Near Palos Bay, Celebes	87	655 m.
Sc. deforme n. sp.	Near Palos Bay, Celebes	87	655 m.
Sc. curiosum n. sp.	North of Sumbawa	45	794 m.
Sc. crinitum n. sp.	North of Sumbawa	45	794 m.
Sc. incertum n. sp.	Between Kofiau and New Guinea	161	798 m.
Sc. chitinosum n. sp.	North of Sumbawa; West of Aru Island	45, 271	794, 1788 m.
Sc. poculum n. sp.	Near Rotti, South of Timor	300	918 m.
Sc. javanicum n. sp.	North of Bali	18	1018 m.
Sc. humile n. sp.	East of Saleyer	211	1158 m.

Sc. gracile n. sp.	East of Saleyer	211	1158 m.
Sc. acutum Hoek	Between Gebé Island and Waigeu Island; . .	151,	845,
	East of Saleyer; North of Celebes	211, 122	1158, 1264 m.
Sc. sessile n. sp.	South of Ceram	241	1570 m.
Sc. formosum n. sp.	South of Ceram; South of Ambon	241, 227	1570, 2081 m.
Sc. inflatum n. sp.	West of Aru Island	271	1788 m.
Sc. moluccanum Hoek	West of Aru Island	271	1788 m.
Sc. elegans n. sp.	West of Buton Island	208	1886 m.
Sc. distinctum Hoek	Northern entrance of Strait of Macassar; . . .	88,	1300,
	West of Buton Island; between Ceram and Misool.	208, 175	1886, 1914 m.
Sc. ciliatum n. sp.	South of Ambon	227	2081 m.
Sc. virgatum n. sp.	South of Timor	295	2050 m.
Sc. arcuatum n. sp.	South of Timor	295	2050 m.
Sc. trapezoideum n. sp.	South of Celebes	214	2796 m.
Sc. sculptum n. sp.	Banda Sea	221	2798 m.
Sc. hexagonum n. sp.	Banda Sea	221	2798 m.
Sc. discolor n. sp.	Banda Sea	221	2798 m.

38 species of *Scalpellum* were thus taken at 32 Stations; two of them (*Sc. rostratum* Darwin and *Sc. Stearnsi* Pilsbry, var. *robusta* n. var.) were collected each at four different Stations; two of them (*Sc. acutum* Hoek and *Sc. distinctum* Hoek) were taken each at three different Stations; six of them (*Sc. uncus*, *Sc. polymorphum*, *Sc. pellicatum*, *Sc. fissum*, *Sc. chitinosum* and *Sc. formosum*) were collected each at two different Stations; all the others (28 species in all) were collected only once. Some of the Stations yielded several species of *Scalpellum*:

at Stat. 45, Lat. 7° 24′ S. and Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud, with some Radiolariae and Diatoms, four species of *Scalpellum* were taken, viz. *Sc. chitinosum, crinitum, polymorphum* and *curiosum*.

at Stat. 251, Lat. 5° 28′.4 S. and Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand, four species of *Scalpellum* were taken, viz. *Sc. candidum, diota, imbricatum*, and *Stearnsi* var.

at Stat. 211, Lat. 5° 40′.7 S. and Long. 120° 45′.5 E. Depth 1158 m. Bottom: coarse grey mud, superficial layer softer and brown, three species of *Scalpellum* were taken, viz. *Sc. acutum, humile* and *gracile*.

at Stat. 221, Lat. 6° 24′ S. and Long. 124° 39′ E. Depth 2798 m. Bottom: solid bluish grey mud with Foraminiferae, three species of *Scalpellum* were taken, viz. *Sc. discolor, hexagonum* and *sculptum*.

at Stat. 256, Lat. 5° 26′.6 S. and Long. 132° 32′.5 E. Depth 397 m. Bottom: greyish green mud, three species of *Scalpellum* were taken, viz. *Sc. hamulus, polymorphum* and *pellicatum*.

at Stat. 271, Lat. 5° 46′.7 S. and Long. 134° 0′ E. Depth 1788 m. Bottom: bluish green mud of a uniform appearance, three species of *Scalpellum* were taken, viz. *Sc. moluccanum, chitinosum* and *inflatum*.

at Stat. 87, Lat. 0° 32′ S. and Long. 119° 39′.8 E. Depth 655 m. Bottom: fine grey mud, two species of *Scalpellum* were taken, viz. *Sc. proclive* and *deforme*.

at Stat. 204, Lat. 4° 20 S. and Long. 122° 58′ E. Depth 75—94 m. Bottom: sand with dead shells, two species of *Scalpellum* were taken, viz. *Sc. rostratum* and *aries*.

at Stat. 208, Lat. 5° 39′ S. and Long. 122° 12′ E. Depth 1886 m. Bottom: solid green mud, two species of *Scalpellum* were taken, viz. *Sc. distinctum* and *elegans*.

at Stat. 227, Lat. 4° 50′.5 S. and Long. 127° 59′ E. Depth 2081 m. Bottom: grey mud with an upper layer of brown, both mixed with sand, two species of *Scalpellum* were taken, viz. *Sc. ciliatum* and *formosum*.

at Stat. 241, Lat. 4° 24′.3 S. and Long. 129° 49′.3 E. Depth 1570 m. Bottom: dark sand with small stones, two species of *Scalpellum* were taken, viz. *Sc. formosum* and *sessile*.

and at Stat. 295, Lat. 10° 35′.6 S. and Long. 124° 11′.7 E. Depth 2050 m. Bottom: fine grey mud, 3 cm. thick, upper layer softer, brown with black stripes, two species of *Scalpellum* were taken, viz. *Sc. arcuatum* and *virgatum*.

Thus H. M. S. "Siboga" which made collections at 323 Stations in the Malay Archipelago met with species of the genus *Scalpellum* at 32 of these, and, while only one species was taken at 20 of these Stations,

at 2 Stations the number of species found was 4,
at 4 Stations the number of species found was 3,
and at 6 Stations the number of species found was 2.

Naturally, this may be considered as purely accidental; one feels inclined to admit, however, that certain places are especially favourable to the life or growth of *Scalpellum*-species. That accident plays a great part cannot be denied; most of the species seem to be "rare" animals and are represented by one or very few specimens only.

Adding the 32 new species collected by the Siboga to the 93 of GRUVEL's list of 1904 the number of species of the genus *Scalpellum* would now be 125. In his Monograph GRUVEL has given extensive tables for the determination of the known species and I hardly think it of any use to give such tables again here. I think it will be possible to recognise the new species with the aid of the description and the figure; I point out for each species as a rule what other species I consider its nearest relation and in what regards the two differ.

Before entering on the description of the different species, a few remarks on the classification of the genus may be permitted. The classification I have given in my Report on the "Challenger"-Cirripedia, which afterwards was used and extended by GRUVEL, though useful for the determination of the species, cannot be said to be a good, that is a natural classification. Such a system should give us, as far as possible at least, a representation of the descent or origin of the different species.

In 1883 I separated in the first place those species in which the valves were imperfectly calcified. No doubt the importance of this character has been overestimated by me; I think now it is of no great use, as there are species with perfectly calcified valves which in other regards quite resemble those with imperfectly calcified valves; forms even occur with perfectly and imperfectly calcified valves, which for the rest are so much alike, that they must be considered as belonging to the same species. This is the case with *Sc. Stearnsi* Pilsbry and with *Sc. polymorphum* n. sp.

The first question to be answered is which forms are the oldest, the earliest of the now living species, and I think there can be no doubt that they are those species which, like

DARWIN's *Sc. villosum*, like *Sc. trispinosum* collected by the "Challenger" and like *Sc. pollicipedoides* taken by the "Siboga", have a simply keeled, relatively short and nearly straight carina, a sub-carina and a rostrum. The shape of the valves in these species, of the lower whorl especially, is triangular with the umbo at the apex, i. e. at the extremity opposite to the peduncle. DARWIN said (in 1851), that *Sc. villosum* "leads on to Pollicipes"; I think he would quite agree now that we had better consider that species and those nearly related as derived from Pollicipes. The form of the valves, their number, the occurrence of a sub-rostrum in *Sc. villosum* (as in the no doubt nearly related *Sc. calyculus* Aurivillius) the occurrence of two extra valves of the lower whorl in one of the specimens of *Sc. pollicipedoides*, mihi (cf. the description of that species in the present report) are I think so many proofs for the correctness of that theory.

The other forms are considered by me to be derived from the species with a simply keeled, straight carina. I think we ought to divide them into three groups which I suppose developed independently from the forms with straight carinae. Calling the place where the umbo is situated in a species like *Sc. villosum* its upper extremity, we see the carina lose its original, straight form either by adding almost equally at both ends, in which case its shape becomes angularly bent; or by growing exclusively downwards, its shape becoming more or less strongly bowed and its umbo remaining at the apex; or, in the third place, by doing both, that is adding at both ends, but much more strongly downwards and assuming at the same time the distinctly bowed shape of the carinae of those species which have this valve simply bowed and not angularly bent.

From the presence of a sub-carina in most and of a rostrum in all I conclude that the species with an angularly bent carina are slightly more primitive than those with a bowed carina. The latter never have a sub-carina and in many a rostrum is also wanting [1]. The structure of the complemental males shows also that the species with an angularly bent carina are more like the primitive Scalpellums than those with a bowed carina. Between the two main groups I place those species in which the carina has an intermediate structure. To this last group belong most of the species for which I proposed, in my report of 1883, to create the division distinguished by imperfectly calcified valves.

We would thus have the following four main divisions:

A. Species in which the carina is nearly straight with the umbonal part as a rule projecting freely; a sub-carina and a rostrum are present. Valves of the lower whorl triangular, with the umbo at the apex. The little males, so far as known, have a capitulum with distinct valves. [Sectio: *Proto-Scalpellum*]

Number of species of this group at present known: 14. It is represented in the collection of the "Siboga" by three species: *Sc. pollicipedoides* n. sp., *Sc. aries* n. sp. and *Sc. acutum* Hoek.

[1] With regard to this valve I wish to point out the following difficulty; originally it always belongs to the valves of the capitulum, but in several species it is overgrown or covered by the rostral lateral, the rostral margins of the right and left valves touching one another in the medial line. Sometimes these margins are slightly hollowed out in the middle, in which case a narrow oval-shaped area is seen at the place where the rostrum should be; in that case it is very difficult to decide whether a rostrum is present or not without preparing and isolating the valves — and it is, of course, better not to do so in all those cases in which a species is represented by only one specimen. The value of the rostrum for classification purposes is diminished by this circumstance.

B. Species in which the carina is angularly bent, the part above the umbo equalling or nearly equalling in size that beneath the umbo; a rostrum is always present and a sub-carina in several species. The little males have a capitulum with valves and a peduncle, or rudimentary valves. [Sectio: *Eu-Scalpellum*]

Number of species of this group at present known: 11. It is represented in the collection of the "Siboga" by four species: *Sc. rostratum* Darwin; *Sc. Peroni* Gray; *Sc. uncus* n. sp.; *Sc. Stearnsi* Pilsbry, var.

C. Species in which the carina may be divided into two parts: a much larger part below the umbo and a smaller, sometimes even very small, above; a rostrum is present as a rule, a sub-carina never. The little males have rudimentary valves in a few cases, no valves as a rule. [Sectio: *Meso-Scalpellum*]

Number of species of this group at present known: 23. It is represented in the collection of the "Siboga" by six species: *Sc. chitinosum* n. sp.; *Sc. inflatum* n. sp.; *Sc. javanicum* n. sp.; *Sc. curiosum* n. sp.; *Sc. polymorphum* n. sp. and *Sc. distinctum* Hoek.

D. Species in which the carina is simply, as a rule strongly, bowed; a sub-carina is always wanting, a rostrum often. The little males as a rule have no valves . . . . . [Sectio: *Arco-Scalpellum*]

To this group belong all the remaining species of *Scalpellum*, about 80. It is represented in the collection of the "Siboga" by 26 species; it may best be subdivided according to the shape of the carinal latus.

a. Carinal latus with the carinal margin convex and the umbo at the upper extremity, where the convex carinal margin and the concave upper margin meet at a sharp angle.

Type: *Scalpellum velutinum* Hoek.

To this division belong about 14 of the known species of *Scalpellum*; it is represented in the collection of the "Siboga" by three species: *Sc. moluccanum* Hoek; *Sc. hamulus* n. sp.; *Sc. diota* n. sp.

b. Carinal latus with the carinal margin divided into two parts which meet at an indistinct or obtuse angle. Umbo at the upper extremity where the upper part of the carinal margin forms an angle with the upper margin of the valve.

Type: *Scalpellum sessile* n. sp.

Two new species collected by the "Siboga" must be considered as belonging to this division: *Sc. sessile* n. sp.; *Sc. ciliatum* n. sp.

c. Carinal latus with the carinal margin divided into two parts which meet at a sharp angle at the place where the umbo is situated. Upper part of the margin often hollowed out under part convex, the angle formed by the two parts more or less projecting beyond the line of the carina.

Type: *Scalpellum hamatum* G. O. Sars.

To this division belong about 36 of the known species of *Scalpellum*; it is represented in the collection of the "Siboga" by seven species: *Sc. discolor* n. sp.; *Sc. poculum* n. sp.; *Sc. arcuatum* n. sp.; *Sc. imbricatum* n. sp.; *Sc. crinitum* n. sp.; *Sc. humile* n. sp.; *Sc. pellicatum* n. sp.

d. Carinal latus with the carinal margin divided into two parts, which meet at an obtuse angle or are almost continuous with one another, the umbo being at the place where the two parts meet. Upper part of the margin not, or only very indistinctly hollowed out.

Type: *Scalpellum formosum* n. sp.

To this division belong 17 of the known species of *Scalpellum*; it is represented in the collection of the "Siboga" by nine species: *Sc. gracile* n. sp.; *Sc. proclive* n. sp.; *Sc. deforme* n. sp.; *Sc. trapezoideum* n. sp.; *Sc. hexagonum* n. sp.; *Sc. praeceps* n. sp.; *Sc. elegans* n. sp.; *Sc. sculptum* n. sp.; *Sc. formosum* n. sp.

e. Carinal latus with the carinal margin not divided into two parts, straight or very slightly hollowed out, with the umbo at the base, where the carinal margin meets with the basal margin. The base of the carina touches, or nearly touches, the upper extremity of the peduncle.

Type: *Scalpellum virgatum* n. sp.

To this division belong 7 of the known species of *Scalpellum*; of these four were collected by H. M. S. "Siboga", viz.: *Sc. virgatum* n. sp.; *Sc. candidum* n. sp.; *Sc. fissum* n. sp.; *Sc. incertum* n. sp.

A. Sectio: **Proto-Scalpellum**

1. *Scalpellum pollicipedoides* n. sp. Pl. V, fig. 9—11.

Valves fifteen, covered by thin and transparent membrane. Scutum triangular, tergum rhombiform, carina nearly straight with the apex projecting freely. Upper latus irregularly triangular. Valves of the lower whorl consisting of a rostrum, three pairs of latera and a subcarina, all of them small, triangular, with the apices pointing outwards. The little male has a capitulum with valves.

This curious species is represented by half a dozen specimens.

The capitulum is nearly trapeziform, the occludent and carinal margins running almost parallel to each other. It is rather thick in the under half, flat in the upper half. The valves are covered by thin, transparent membrane, and are separated from one another by chitinous interspaces of a dark-brown colour.

The scutum is rather large; its apex projects beyond the occludent margin of the tergum and is slightly produced. The lateral and basal margins pass over into one another quite insensibly, so that the form of the scutum is triangular with a strongly arched basis. The tergal margin is long, the occludent margin hollowed out.

The tergum is rhombiform and large. The part of the carinal margin above the apex of the carina has about the same length as the occludent margin, the other part of the carinal margin nearly equals the scutal margin. Near the apex the two terga slightly diverge from one another.

The carina is only very feebly bowed longitudinally and has the umbo at the apex which in the largest specimen projects freely. The carina has no flat roof but is laterally bowed and not very deeply keeled. The width increases from the apex to the base; the surface is not smooth but feebly, transversely hollowed out at five places over its length.

The upper latus is small, of triangular shape, with the scutal margin strongly hollowed

out, the tergal and carinal margin confluent and convex, and the basal margins also confluent and strongly convex.

The rostrum is the largest of the valves in the lower whorl. It projects freely for about half its length and has the umbo at the apex which is pointed. Its shape is triangular with the sides hollowed out.

The rostral and carinal latus are of about the same size and shape: triangular, with the apex projecting from the surface of the capitulum.

The infra-median latus has about the same shape but is much smaller.

The sub-carina much resembles the rostrum; it is slightly smaller however and stands out in a more horizontal direction.

The peduncle is short, wide at the summit, slightly narrower only at the base. The calcified scales are very small and not arranged very regularly. They are placed rather close to one another and extend from the surface as bluntly-conical papillae.

Size. The length of the capitulum of the largest specimen was 4 mm., the total length 6,3 mm. The other specimens are but slightly smaller.

The study of the structure of the hermaphrodite animal contained within the capitulum has yielded the following results.

Mouth placed near the adductor muscle; elongated in a vertical direction. Labrum not very swollen, slightly elongated in a longitudinal direction; crest without distinct teeth; palpi minute, triangular in outline, with the apex blunt. Apex and outer margin with rather numerous hairs.

Mandibles with four teeth and the lower angle delicately pectinated. Two very minute teeth are inserted in the cavity between the first and the second tooth; upper side of the fourth tooth pectinated. Surface of the mandible near the toothed edge covered with very delicate hairs placed in groups of two or three; inferior margin clothed with longer hairs.

Maxillae short and broad; two stronger spines and one or two smaller ones at the upper end of the edge; a small notch beneath the upper pair and a single spine planted at its base. The inferior part of the edge forms a sharp angle with the under margin and bears 7 to 8 pairs of spines. On the outer surface numerous groups of hairs (three or four in a group), near the spine-bearing edge.

Outer maxillae rather stout, of oval shape with long bristles on the outer surface.

Cirri. First pair not at a considerable distance from the second. Rami slender and not very unequal in length. The longest has 8, the shortest 7 segments. Upper segments slightly narrower than the basal ones; the latter slightly protuberant at the extremity. Spines relatively long, some of those on the outer segments more than twice as long as the segment.

Second cirrus with rather short rami of 9 segments, lower segments short and broad, upper segments more elongate; 3 pairs of longer spines on the anterior margin as a rule.

The four posterior pairs with their segments, especially the terminal, much elongated. The middle segments more protuberant anteriorly than the others. The segments bear as a rule three pairs of longer spines and a fourth (sometimes even a fifth) pair much more delicate on the front aspect. Dorsal tufts of three or four spines at the extremity of each segment.

Caudal appendages triangular, uni-articulate, small; a tuft of about half a dozen delicate hairs at the extremity.

Penis, rather short, reaching to the extremity of the fifth segment of the last pair of cirri; its basal part broad with only a few scattered hairs, the terminal part of about the same length as the basal part, cylindrical, rather narrow, indistinctly ringed. It bears very delicate hairs, which are irregularly distributed over the surface and a rather dense tuft of hairs at the extremity.

The mantle-cavity of the hermaphrodite animal investigated more in detail contained six rather large and nearly globular eggs. The greatest diameter of the eggs is 0,34 mm., the shortest 0,28 mm. They contained larvae in the Nauplius-stage, some of the larvae had partly shed off the exuviae.

The male of this species is a true complemental male. I found two of them in the one, one in the other pouch of the hermaphrodite specimen. In fig. 10 the place occupied by this pouch is indicated as a little swelling (*b*). The male is figured Pl. 5, fig. 11; its size is 0,35 mm. × 0,25 mm. It has six valves: two scuta, two terga, a carina and a rostrum, the general shape of which can be seen from the figure. The scutum is the largest, the rostrum is much broader than the carina. The tergum has an irregular shape and is divided into two parts: a larger somewhat excavated at the apex and a very small one at the place of the primordial valve. Shape and position of the valves resemble the corresponding parts in the male of *Sc. Peroni* and *Sc. villosum* as described by DARWIN. But the males of the present species have no narrow peduncle, the capitulum going over quite insensibly into the short and flattened part to which the prehensile antennae are attached. The membrane connecting the valves is very slightly rough, but it does not bear distinct hairs. Extremely minute hairs seem to be planted on the surface near the peduncular pole only. The musculature of the peduncular part of the sac is strongly developed.

The structure of the little body within the sac corresponds in general but in reduced condition with that of the hermaphrodite animal as also with that of the males of the nearly related species *Sc. villosum* and *Sc. Peroni*. It has very large eyes situated in the median line, beneath, or rather in front of the strongly developed adductor muscle. The mouth is slightly bullate; the cirri have but few segments (four in the first, five in the second pair). The penis is short, cylindrical, rounded at the extremity, where it bears a few curled hairs or bristles.

This species was collected during the cruise of H. M. S. "Siboga" at:

Stat. 274. December 26, 1899. Lat. 5° 28'.2 S., Long. 134° 53'.9 E. Depth 57 m. Bottom: sand and shells, stones. 6 specimens.

Observations. This is a very curious species. It belongs to the same group as *Sc. villosum* (Leach) and *Sc. trispinosum* mihi as is shown at once by the shape of the carina. It has one pair more latera, however, than one of these two species and the general shape of the capitulum is more like a normal *Scalpellum* in consequence. Like *Sc. villosum* and *trispinosum* it comes near to *Pollicipes*, especially *P. sertus* and this is particularly the case with regard to the shape of the valves of the lower whorl.

One of the specimens shows this relation in a still more conspicuous way and I have

described the discovery of that specimen as an interesting case of reversion in a short note published by the Amsterdam Academy of Science[1]. I quote from that paper the following:

Looking over the six specimens of this new species, I was struck by finding that one of the specimens, though in other regards similar to the other five, differed from them by having in the lower whorl of valves two latera in addition to the three which all the specimens possess. In fig. 9, Pl. V[2] the left side of a normal, in fig. 10 the same side of the abnormal specimen is represented. (At the right side only one of the additional valves is developed.) In fact, the few small valves which according to DARWIN were wanting in the lower whorl of *Sc. villosum* to convert it into a *Pollicipes* occur in one of the specimens of this new species. By calling it a case of reversion I would indicate the high importance, which from an evolutionary point of view I attach to this abnormality. We need not go so far as to consider this species as representing exactly the "missing link" between the genera *Pollicipes* and *Scalpellum*, but I think the case shows clearly that a form with more numerous calcareous plates in its capitulum (like *Pollicipes*) is the older, the form with fewer (like *Scalpellum*) the younger one; moreover that the *Scalpellum*-species with straight carinae, inhabitants of shallow water, must be considered as the oldest, i. e. the species most resembling the primitive form of *Scalpellum*.

2. *Scalpellum aries* n. sp. Pl. V, fig. 12.

Valves thirteen. Carina straight. Scutum and tergum large. Upper latus narrow, nearly reaching the peduncle. Valves of the lower whorl six: a large and prominent rostrum, two small rostral latera of triangular shape, two narrow carinal latera and a rather strong triangular sub-carina.

This species is represented by a single specimen only.

The shape of the capitulum is nearly quadrangular with a triangular apex, being broadest at its lower extremity. The scuta, terga and carina are much larger than the other valves, the upper latus is medium-sized and of the valves of the lower whorl the rostrum is the only one that is strongly developed. All the valves stand rather close together and are not covered by membrane. Their colour is red or reddish, parts of the carina, of the tergum and the scutum only being quite white.

Scutum oblong, breadth slightly less than half the length, with the upper triangular portion produced and the apex projecting beyond the occludent margin of the tergum. The occludent margin is slightly hollowed out, the lateral margin convex.

Tergum large, oblong, elongate-ovate, bluntly pointed at the apex, forming a sharp angle at the lower extremity.

Carina straight with the apex neither directed forward, nor backward; with a laterally bowed roof, gradually widening from the upper to the basal end, rather deeply concave. The upper part of the roof is at some distance from the tergum, which distance grows broader towards the apex, the interspace being filled up by triangular lateral parts.

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[1] K. Akademie v. Wetensch. te Amsterdam, Proceedings of the Section of Sciences, VII, 1905, p. 90.

[2] Of the present publication.

Sub-carina triangular, the umbo pointing outwards; laterally it slightly overlaps the carinal latera.

Rostrum strong and rather large, having the shape of a pyramidal wedge, with the apex very prominent beyond the occludent margin of the scutum. Lateral margin nearly straight.

Latera of the lower whorl two pairs, small, corresponding probably with the rostral and carinal latera of other species of *Scalpellum*. The inferior angle of the pentagonal upper latus also meets where they nearly touch one another.

Peduncle wide at the summit, conical, short. Surface with very numerous narrow, chitinous scales, placed rather far from each other, arranged in regular rows.

Length of the capitulum 8 mm., of the peduncle about 2 mm.

The "Siboga" collected this interesting form at:

Stat. 204. September 20, 1899. Lat. 4° 20′ S., Long. 122° 58′ E. Depth 75—94 m. Bottom: sand with dead shells. 1 specimen. (A few specimens of *Sc. rostratum* Darwin were found at the same Station.)

General Remark. This curious form belongs to the same group of species as *Scalpellum villosum* Leach, *Sc. trispinosum* mihi, *Sc. sexcornutum* Pilsbry and some of the species provisionally described by Aurivillius and which are all characterised by straight or nearly straight carinae. In *Sc. aries* the carina may really be said to be straight; it can be distinguished easily from the other species by the number (13) of its valves and by the very characteristic shape of its rostrum.

3. *Scalpellum acutum* Hoek. Pl. VII, fig. 1.

Hoek, Cirripedia collected by H. M. S. "Challenger". 1883, p. 80, pl. III, fig. 19, pl. VIII, fig. 12.

This interesting deep-sea species was collected by H. M. S. "Siboga" at three different Stations. They are very small animals: I measured two, in one the total length was 7,6 mm., the length of the capitulum 5,6 mm., in the other respectively 6,5 and 4,7 mm.

I think there can be no doubt, that the specimens are identical with those collected by the "Challenger". Gruvel[1] has described as a new species *(Sc. longirostrum)* a form of *Scalpellum* much resembling my *Sc. acutum*, the main difference being that the carina of the new species is somewhat broader. My figure ("Challenger" Cirripedia Pl. III, fig. 19) represents the little animal with the rostral side slightly turned up, so that the carina in the figure looks narrower than it really is. And my description: "Carina short, simply bowed; sides almost wanting, only slightly developed in the superior part" has been misleading in so far that I should have added: a little more so towards the inferior extremity. Of the other differences Gruvel points out, the height of the sub-carina, which he says nearly equals that of the rostrum ("presque aussi élevée que le rostre") and which is much smaller in the "Challenger" specimens as also in those collected by the "Siboga", is by far the most important. But altogether these differences are only slight: in comparing the specimens with one another they may perhaps prove after all to be identical.

[1] Gruvel, A., Cirrhipèdes du "Travailleur" et du "Talisman". 1902, p. 70.

At the end of the description of *Sc. longirostrum*, GRUVEL in his "Monographie" (l. c. p. 58) says that the dwarf males also differ. It is true that I named *Sc. acutum* as one of the species whose males have no peduncle, mouth or stomach (Challenger Cirripedia, Anatomical part, p. 20). However, as I did not observe the male of this species (Ibidem, p. 4), this was a supposition only and the name of the species, therefore, was placed in brackets. I found little males (one on each) on two of the "Siboga" specimens and I figure one of them on Pl. VII, in fig. 1. Comparing this figure with that given by GRUVEL for the male of *Sc. longirostrum*, the main difference is the absence of a peduncle in GRUVEL's and its presence in my figure. Had my specimen been without a peduncle then I would admit at once that the little stump had been broken off on isolating the little animal from the female — I dare not say that this happened to Mr. GRUVEL's specimen, but I think it is possible. . . . .

I consider this species, like *Sc. squamuliferum* Weltner and *Sc. striatum* Aurivillius, as belonging to the group of *Proto-Scalpellums*. The carinae of these species are not quite straight but they are only little bowed and (with the exception of that of *Sc. squamuliferum*) relatively short. Further, these species have a rostrum and a sub-carina and the valves of the lower whorl triangular with the umbo at the apex; they have (so far as known) males with a capitulum with valves and a peduncle. In all these regards the present species corresponds with the others of this division.

The "Siboga" collected this species at the following Stations:

Stat. 122. July 17, 1899. Lat. 1° 58′.5 N., Long. 125° 0′.5 E. Depth 1264—1165 m. Bottom: stone. 2 specimens.
Stat. 151. August 12, 1899. Lat. 0° 12′.6 S., Long. 129° 48′ E. Depth 845 m. Bottom: fine grey mud with coarse particles. 1 specimen.
Stat. 211. September 25, 1899. Lat. 5° 40′.7 S., Long. 120° 45′.5 E. Depth 1158 m. Bottom: coarse grey mud. 2 specimens.

What I said in my "Challenger" publication on the distribution of this species, viz. that it occurred at places situated very far from one another, has now proved to be true in a still higher degree: whereas the "Challenger" found it in the Atlantic, near the Azores, and in the Pacific, near the Kermadec Islands, it has now been observed in the Malay Archipelago.

According to GRUVEL the only specimen of his *Sc. longirostrum* he could investigate was taken in the Atlantic Ocean not far from the coast of Portugal at a depth of 1923 m.

B. Sectio: **Eu-Scalpellum**

4. *Scalpellum rostratum* Darwin. Pl. V, fig. 13.

DARWIN, Monograph of the Sub-class Cirripedia. The Lepadidae, 1851, p. 259, pl. VI, fig. 7.

I doubt whether this species has ever been observed since DARWIN published his description. Yet it is perhaps the commonest of the genus under the tropics — at least in the Malay Archipelago; the "Siboga" collected it there at four different places, 6 specimens in one haul at two of them, and numerous specimens at a third.

I have nothing to add to DARWIN's excellent description of this species, neither for the hermaphrodite form nor for the complemental males. DARWIN discovered that the latter were attached in this species to the integument of the hermaphrodite, in a central line, between the labrum and the adductor scutorum muscle, three individuals in a group. Opening the capitulum of one of the "Siboga" specimens I found the little males at once at the place indicated by DARWIN, the only difference being that I found not three but four of them attached to the hermaphrodite. The size and form of the complemental male and of its rudimentary valves (carina and scutum) are in the main as described by DARWIN. The largest specimen measured 0,91 mm. (according to DARWIN its length is $^{35}/_{1000}$ of an inch = 0,89 mm.). The scutum is narrow; it is considerably smaller than that in DARWIN's figure, but it has exactly the size (0,2 mm.) which it should have according to DARWIN's description. The whole of the sac, which represents a combination of capitulum and peduncle, is covered with very minute hairs. Beneath the rudimentary carina and down the peduncular part of the sac are planted numerous much longer spines which to a large extent are bifid at the extremity. The fig. 13 of Pl. V has been drawn with the camera from the largest of the specimens.

DARWIN's specimens were from the Philippine Archipelago, Island of Bantayan, attached to a horny coralline: 20 fathoms (about 36 m.). The "Siboga" collected it at the following places:

Stat. 47. April 8—12, 1899. Bay of Bima (North Coast of Sumbawa). Depth 13—55 m. Numerous specimens.
Stat. 204. September 20, 1899. Lat. 4° 20′ S., Long. 122° 58′ E. Depth 75—94 m. Bottom: sand with dead shells. 2 specimens.
Stat. 213. Sept. 26—Oct. 26, 1899. Saleyer anchorage and Surroundings. Depth down to 36 m. Bottom: coral reefs, mud and mud with sand. 6 specimens.
Stat. 294. January 23, 1900. Lat. 10° 12′.2 S., Long. 124° 27′.3 E. Depth 73 m. Bottom: soft mud with very fine sand. 6 specimens.

5. *Scalpellum Peroni* (Gray). Pl. V, fig. 14, 14*A*, 14*B*.

Smilium Peronii J. E. Gray, Annals of Philos. New series, X, 1825.
Scalpellum Peronii Darwin, Monograph. Lepadidae, 1851, p. 264, pl. VI, fig. 6.

I refer to this species the specimens of *Scalpellum* which were collected by the scientists of the "Siboga" Expedition at the Jedan Islands. Most probably the place where they were found is the anchorage off Palu Jedan, east coast of Aru Islands (Pearl Banks).

There are in all three specimens, one of which is extremely small. The largest one has been figured; it has a total length of 22 mm. and a capitulum of 13 mm. It is considerably smaller than the specimens investigated by DARWIN, which had a total length of little more than one inch (25,4 mm.) and the capitulum of which measured about three quarters of an inch (19 mm.). Perhaps the differences between the description and figure given by DARWIN and the specimens from Jedan must be ascribed to the circumstance that the latter specimens are not quite full-grown.

These differences are in the first place, that the spines which clothe the membrane covering the valves and the interspaces are by no means so strong and so dense as they are represented in the figure given by DARWIN; and secondly, that the rostrum and the subcarina,

which are figured by DARWIN as freely projecting beyond the rostral and carinal margins of the capitulum, are much less strongly developed and hardly projecting in the specimens from Jedan.

So far as I know this is the first time, that specimens of this species have been collected since the publication of DARWIN's Monograph. He knew the species from specimens found in the Swan River, Australia, attached to a coralline, and from Port Western, Bass Straits (Astrolabe Voyage): the Swan River is on the west side of Australia, Bass Straits on the south. The Jedan Islands, the third place where the species occurs, lie between the north of New Holland and New Guinea. [GRUVEL [1], found three specimens of *Sc. Peroni* in the collections of the Paris Muséum d'histoire naturelle; but their habitat is unknown. He pointed out that these specimens are not covered by a complete coating of fine and numerous hairs as in DARWIN's description and figure].

6. *Scalpellum uncus* n. sp. Pl. V, fig. 15; Pl. VII, fig. 2, 3.

Valves thirteen. Carina angularly bent with the umbo in the middle of its length. Rostrum rather large. Three pairs of latera. Upper latus pentagonal. Sub-carina pyramidal, standing out beyond the surface of the carina.

Of this species there are three specimens representing two different forms.

The capitulum is flat, broad in the middle, the upper part slightly produced. It has 13 valves with narrow, but distinct intervals. The valves are not covered with membrane in the one (Station 285) and are covered by a resistant and pigmented membrane in the two other specimens (Station 47[b]).

Scutum middle-sized, with the upper end pointed; nearly quite flat; lateral margin nearly straight, parallel with the occludent margin. In the specimen without membrane a distinct swelling is visible at the place where, on the inner side, a pit is present for the adductor muscle. Basal margin composed of a longer and a shorter segment, making an angle with one another.

Tergum large, triangular, flat. Occludent margin distinctly convex towards the apex which is recurved; carinal margin projecting a little above the apex of the carina; scutal margin slightly convex.

Carina bowed, laterally strongly compressed, and thus internally deeply concave; upper portion above the umbo nearly as long as the part beneath the umbo; roof laterally convex growing wider from the umbo downwards and indistinctly separated from the parietal parts of the valve.

Upper latus pentagonal, with the apex rounded and the umbo at a short distance from the apex.

Rostrum of considerable size, internally concave; outline of the upper portion triangular, of the lower portion trapeziform. The umbo is at the apex, which, especially in the specimens covered with membrane, slightly projects beyond the occludent margin of the capitulum.

Rostral latus very thick and solid, large, irregularly pentagonal, with the umbo near the rostral margin and near the base of the valve and distinctly projecting outwards.

[1] GRUVEL, A., Révision des Cirrhipèdes. Nouvell. Archiv. d. Muséum. (IV). IV, 1903, p. 234.

Carinal latus elongated pentagonal, narrow, with the umbo about in the centrum of the surface, slightly projecting outwards.

Sub-carina small; solid, pyramidal, standing out beyond the surface of the carina.

Peduncle about half the length of the capitulum, rather narrow, narrowest about the middle of its length; surface with minute chitinous scales standing at some distance from one another. In one of the membrane-covered specimens of Station 47^b the length of the peduncle is more than half the length of the capitulum.

Size. Length of the capitulum 9,1 mm., of the whole animal 13 mm. in the specimen from Station 285; in the largest specimen from Station 47^b the corresponding dimensions are 9 and 13,8 mm.

Complemental males. Two complemental males were observed in one of the specimens from Station 47^b attached to the surface of that part of the sac or mantle of the hermaphrodite animal which unites the inferior halves of the two scuta. These males are relatively large, the longest diameter of the body being 0,9 mm. Their shape is elongated oval and the body is divided into a larger capitular part and a very short peduncle. The capitulum has six valves: 2 scuta, 2 terga, 1 carina and 1 very large rostrum. Fig. 3 of Pl. VII has been drawn from the male of this species; it has a great resemblance to the male of *Sc. Peroni* and, no doubt, that of several other shallow-water species.

This species was collected by H. M. S. "Siboga" at two Stations, viz. at:

Stat. 47^b. April 12, 1899. Entrance to Bay of Bima (Sumbawa). Depth 296 m. Bottom: fine sand with mud (coral). Two specimens. One of them was attached to a small stick, to which a piece of coral was also attached.

Stat. 285. January 18, 1900. Lat. 8°39′.1 S., Long. 127°4′.4 E. Depth 34 m. On the limit between mud and coral, Lithothamnion. (Anchorage south-coast of Timor). One specimen.

Observations. The present species comes nearest to *Sc. Peroni* of the known species, e. g. in the number of valves, the shape of the carina and the form (not the size) of the tergum. It differs from it by the absence of the fine spines which cover the membrane in *Sc. Peroni*, by the valves not being separated by rather wide interspaces of membrane and in the third place by the shape of the latera.

At first I considered the specimen from Station 285 (Pl. VII, Fig. 2) without a distinct membrane as being different from the specimens from Station 47^b (Pl. V, fig. 15), which are covered with a very conspicuous membrane. Looking at the shape of the capitulum and at the form of the different valves more closely, I became convinced, however, that there was no reason to consider them as specifically distinct. It is true that they were taken at very different depths; but other species also range over depths of rather great difference. Thus, for example, *Sc. vulgare* Leach observed in very shallow water and also at a depth of 97 m. For this species Gruvel [1] has described a very characteristic case of polymorphism, corresponding in many regards to what I found in *Sc. uncus*, viz. that specimens of different localities [? and depths] show differences in the development of the membrane covering the valves, of the interspaces separating the valves, as also in the grade of calcification, the hairiness of the membrane etc.

[1] Gruvel, A., Révision des Cirrhipèdes. Nouvelles Archives du Muséum. (IV). IV, 1903, p. 234.

7. *Scalpellum Stearnsi* Pilsbry var. *robusta* and var. *gemina* n. var. Pl. VI, fig. 1—12.

Scalpellum Stearnsi Pilsbry is a shallow-water species from Japan. It was described for the first time (1890) by PILSBRY[1] and a year later by FISCHER[2] (as *Sc. calcariferum*). Both WELTNER (l. c. p. 250) and GRUVEL (l. c. p. 44) consider the species of FISCHER as synonymous with that of PILSBRY, and comparing the figures there can be no doubt that they are right.

In the Malay Archipelago H. M. S. "Siboga" collected at different Stations and at depths varying from 204—450 m., specimens of a *Scalpellum*-species, which at first sight showed great resemblance with PILSBRY's *Sc. Stearnsi*. I have been long in doubt, whether they belong to that species or not. The result of a careful comparison of the specimens of the Malay Archipelago with one another and with a specimen from Nagasaki (Japan) has been, that I do not consider them as specifically different, but that the animals collected by H. M. S. "Siboga" must be regarded as two varieties of PILSBRY's species.

I give in fig. 1, Pl. VI, a figure of PILSBRY's *Sc. Stearnsi* from a specimen collected by LISCHKE near Nagasaki which belongs to the collections of the Berlin Museum of Natural History[3]. It was in dry condition but it corresponded in all regards with the descriptions and figures given by PILSBRY and FISCHER. The varieties *robusta* and *gemina* differ from the Japan species in several regards as will be shown.

a. *Scalpellum Stearnsi*, var. *robusta*. Pl. VI, fig. 2, 3, 8—12.

The variety *robusta* differs at first sight by its much more plump, robust shape and by the length of its peduncle. The Japan form has the capitulum more elongated, its length measured along the occludent margins of scutum and tergum being equal to one and a half times the breadth; the apex of its tergum is produced; the length of the peduncle is nearly the same as the breadth of the capitulum and is by all means considerably shorter than the length of the latter. In the variety *robusta* the length of the capitulum is only once and a third its breadth; the apex of the tergum is not produced and the peduncle is considerably longer than the capitulum.

The shape of the different valves in the variety *robusta* is not very different from that in the original Japan species. Yet the upper latus and the infra-median latus are both considerably broader in this variety and this is also the case with the tergum. The latter valve has the apex and the angle formed by the carinal and scutal margins blunt.

As in the Japan specimens the marginal parts of the valves are not calcified: if the surface is thoroughly cleaned with a brush, the calcified portion which is white, is easily distinguished from the chitinous marginal parts which border the valves. In the Malayan specimens, however, the calcified portions are not at the surface, the whole valve being covered by a rather thick chitinous coating. Whether this is also the case in the shallow-water form from Japan I cannot

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[1] PILSBRY, H. A., Description of a new Japanese *Scalpellum*. Proceed. Acad. Nat. Sci. Philadelphia. 1890, p. 441—443. *(Sc. Stearnsi)*.

[2] FISCHER, P., Description d'une nouvelle espèce de *Scalpellum* du Japon. Bullet. de la Soc. Zoolog de France. XVI, 1891, p. 116—118. *(Sc. calcariferum)*.

[3] The director of the Museum, Prof. KARL MÖBIUS, and the Keeper of the Collection of Crustaceans, Dr. W. WELTNER, made the study of these specimens easy and agreeable to me.

say; the specimens I have been able to investigate were in dried condition and did not show this detail.

In the specimens of the variety *robusta*, the chitinous membrane is developed very strongly along the line separating the capitulum from the peduncle; here it forms a cushion-like swelling over the basal portions of the valves of the lower whorl. The very long peduncle seems also a remarkable characteristic of this variety. All the known species of *Scalpellum* have rather short peduncles, the longest I have seen being that of *Sc. Darwini* mihi, which measures $^{2}/_{3}^{rds}$ of the length of the capitulum. Of the three specimens of the variety *robusta*, one is considerably smaller, most probably not full-grown (this specimen is figured Pl. VI, fig. 3; its capitulum is 28,6 mm. long, its peduncle 20 mm.); the other two seem to be full-grown:

the length of the capitulum is 48 mm. in the one and 52,5 mm. in the other specimen.
the length of the peduncle is 92 mm. in the one and 73 mm. in the other specimen.

Pilsbry and Fischer both give figures of this species representing specimens at their natural size. Pilsbry says in his description that the peduncle is long and his figure represents it about as long as the capitulum, which is already a fair length for a species of *Scalpellum*; Fischer's figure shows the peduncle cut off transversely, only slightly longer than half the length of the capitulum; in his description he says nothing about the length of the peduncle. In the two specimens from Nagasaki I was able to investigate, the dimensions of the capitulum and peduncle are as follows:

the length of the capitulum is 48 mm. in the one and 44 mm. in the other specimen.
the length of the peduncle is 30 mm. in the one and 14 mm. in the other specimen.

There are moreover in the variety *robusta* very characteristic and very prominent rings on the surface of the peduncle. The rather large scales are placed in rows which project freely over the surface as so many hoops and are separated from one another by rather deep circular grooves. The specimen of 48 mm. capitulum-length has about 40, the other about 33 such rings on the surface of the capitulum. They are very distinct on the peduncle of the smaller specimen of the variety *robusta* also, but their number is there only 14.

There are in the "Siboga" collection three specimens in all which I consider to belong to this variety. They were caught at three different Stations, viz.

Stat. 5. March 10, 1899. Lat. 7° 46′ S., Long. 114° 30′.5 E. Depth 330 m. Bottom: mud. Large specimen, figured Pl. VI, fig. 2.
Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand. Large specimen attached to a piece of shell, which bears numerous tubes of tubicolous Annelids on its surface.
Stat. 254. December 10, 1899. Lat. 5° 40′ S., Long. 132° 26′ E. Depth 310 m. Bottom: fine, grey mud. Small specimen, figured Pl. VI, fig. 3.

b. *Scalpellum Stearnsi*, var. *gemina*.

The variety *gemina* has imperfectly calcified valves. In the Japan species and in the variety *robusta* the valves with the exception of the marginal portions are perfectly calcified, the calcified portion having the shape of the valve itself. In the variety *gemina* the calcified

portions of the scutum, tergum, upper latus, and infra-median latus have a shape of their own, which can be made out only by separating them from the chininous covering by means e. g. of caustic potash.

The figure 4 of Pl. VI represents this variety and illustrates another peculiarity of the specimens caught by H. M. S. "Siboga"; the four specimens form two couples of two: in the pair figured both specimens are attached to one another and at the same time to the long silicious needles of a sponge; in the other couple the one is attached to the extremity of the peduncle of the other. The shape of the calcareous portions can be distinguished through the chitinous membrane which covers almost the whole surface; very small parts of the scutum near the angle formed by the occludent and tergal margins, and of the tergum near the angle formed by the occludent and carinal margins, remaining uncovered. At these places, where the umbones are, the surface of the valve is quite white and opaque, the chalk being quite amorphous; the rest of the valve appearing blueish, more or less transparent and crystalline. Naturally, this difference can be seen best after isolating and cleaning the calcareous valves (Pl. VI, fig. 5). The peduncle of this variety is longer than the capitulum; it is not so long, however, as in the var. *robusta*. In the four specimens I was able to investigate, the dimensions were as follows:

Specimen 1. Length of capitulum $47^1/_2$ mm. Length of peduncle 60 mm. Number of rings on peduncle ± 48.

Specimen 2. Length of capitulum 49 mm. Length of peduncle $60^1/_2$ mm. Number of rings on peduncle ± 49.

Specimen 3. Length of capitulum 45 mm. Length of peduncle 56 mm. Number of rings on peduncle ± 40.

Specimen 4. Length of capitulum 45 mm. Length of peduncle $48^1/_2$ mm. Number of rings on peduncle ± 48.

The rings formed by the scales on the surface of the peduncle are not so prominent as in the variety *robusta*, they are still, however, very conspicuous. The peduncle as a whole is stout and cylindrical — it looks like a piece of rope.

This variety was collected by H. M. S. "Siboga" at one Station only, viz.:

Stat. 74. June 8, 1899. Lat. 5° 3'.5 S., Long. 119° E. Depth 450 m. Bottom: Globigerina ooze. Four specimens: two couples of two.

In the descriptions of Pilsbry and Fischer, details on the structure of the animal's body are wanting. I studied some of the peculiarities with the aid of one of the specimens of Station 74.

Mouth. Labrum not very bullate with a strongly developed, anteriorly projecting part which is triangular and pointed at the extremity; crest with a few extremely minute triangular teeth. Palpi elongate, about three times as long as broad, densely beset with hairs towards the extremity and along the internal margin.

Mandibles stout with four teeth and the inferior angle. Between the first and second teeth two much smaller ones are observed, making the number six, if these are also counted. Inferior angle blunt, indistinctly pectinated (Pl. VI, fig. 7).

Maxillae with a long, sinuous edge and a great number of nearly equal spines. Those at the upper corner are slightly larger and another group of the larger spines is planted at one-fourth the height from the inferior angle. The apodeme is stout and not very long.

Outer maxillae are well-developed with the bristles of the nearly straight inner margin divided into two separate tufts, separated from one another by a little excavation without bristles. Exteriorly they are swollen and not very densely beset with bristles. The opening leading into the body-cavity is large and situated on the top of a rounded protuberance.

Cirri. First pair short and very stout; rami not very unequal in length; much more so in the number of segments, and especially in breadth (Pl. VI, fig. 6). The anterior segment has nine, the posterior sixteen segments. The segments of the anterior ramus are oblong in transverse direction and are only united with one another over part of the breadth; the segments of the posterior ramus are as broad as they are long, with the exception of the first segment which is longitudinally oblong. In both rami the segments bear numerous spines along their margins, the outer segments over the whole surface.

Second-sixth cirrus differ from one another mainly in length; this difference is greatest between the second and third cirrus. In the second cirrus the anterior ramus is moreover a little broader than the posterior ramus, in the other cirri this difference does not exist. All the cirri give one the impression of being stout and well-developed.

Caudal appendages small, composed of six cylindrical segments, the width of which diminishes considerably from the first to the last; each segment bears a few very delicate bristles at the extremity; the last segment has about half a dozen longer ones on the rounded apex.

Sex. The specimen investigated showed no trace of male genital organs: neither testicula nor penis; I think this species must be considered as belonging to the group of unisexual species of which I discovered several representatives when studying the Cirripedia of the "Challenger" expedition. The specimens the description of which is given above were probably all females.

Males. At first I could not find the males of this species. At last I found them on the large specimen of Station 5: very small bead-like individuals attached in great number to the surface of that part of the sack or mantle of the female which connects the inferior halves of the two scuta at their occludent margin. I counted well over a hunderd of these little animals. Each of them is enclosed in a chitinous sack and are placed so near one another as to touch and even to flatten each other mutually. Fig. 9, Pl. VI represents a group of three of them; in fig. 8 one of them is seen a little more enlarged. They are attached to the outer surface of the chitinous sack of the female with their small antennae, and their surface is hirsute with very short spines. The opening giving entrance to the interior of the sac is at the top of a little conical papilla which projects beyond the surface of the remaining part of the sac. Round the opening are four very small calcareous parts like so many rudimentary valves and between these, small excrescences with short hairs, like minute tentacles, are planted. I have not been able to study the internal structure (which can be done by making microtome sections only)

but I observed the testiculum and the receptaculum seminis in several specimens. The longest diameter of the specimen of fig. 8 measured 0,66 mm., the shortest about 0,5 mm.

I observed a few (3) males of exactly the same shape and structure and at the same place in one of the specimens of the var. *gemina* from Station 74, and I think the fact that they are wanting in the other specimens must be considered as the consequence of the season or age. While studying the Cirripedia of the "Challenger" more than 20 years ago, I discovered that the larvae of *Sc. Stroemi* develop into the Cypris-stage before leaving the egg-membrane. Whether all the eggs did so could not be made out; but that there are *Scalpellums* which develop without a free-swimming Nauplius-stage cannot, from that discovery, be doubted. One might suppose, that only the complemental-males (or the dwarf-males in the unisexual species) had such an abbreviated development. It seems probable, however, that there are several among the deep-sea species whose females as well as males develop without passing through a free-swimming Nauplius-stage. I conclude this from the fact, that I found half a dozen very small specimens (females and males) attached to the surface of the scutum of the large female *Scalpellum* which was collected at Station 5. DARWIN speaks of the male larva of *Sc. vulgare* "crawling on the scuta of the hermaphrodite" and of discovering the fold in the shell where it invariably attached itself: that males should be found on the scutum is not at all surprising, but for the females it would be different, unless it be that they do not swarm out, but creep from the cavity of the mantle in the cypris- or so-called pupa-stage.

That the little *Scalpellums* I found attached to the outer surface belong really to the same species admits of no question. I figure one of these small animals Pl. VI, fig. 11, and the tip of the capitulum more strongly magnified in fig. 12: the capitulum has exactly the same tentacular appendages which I observed in the males and about at the same place with regard to the primordial scutum and tergum. What the physiological meaning of these tentacles is, is difficult to say; they are larval organs which the females seem to loose and which the males keep in mature condition. Morphologically these tentacles are no doubt also of importance — by all means they render us the good service of enabling us to demonstrate that the little females attached to the fullgrown specimens belong to the same species as the dwarf males attached to the mantle-surface between the two scuta.

C. Sectio: **Meso-Scalpellum**

8. *Scalpellum chitinosum* n. sp. Pl. VII, fig. 4.

Valves thirteen, covered by chitinous membrane. Scutum and tergum imperfectly calcified. Carina with the umbo at some distance from the apex, angularly bent. The part beneath the umbo strongly bent. Upper latus quadrangular, broad with the apex produced in the direction of the scutum. Upper part of the infra-median latus broad triangular. Umbo of the carinal latus at the base, projecting beyond the line of the carina. Rostrum wanting or not calcified.

The collection made during the cruise of H. M. S. "Siboga" contains two (perhaps 3) specimens of this species.

The capitulum is flat and very broad, the length being less than one and a half

times the breadth. The occludent and carinal margins are both strongly convex. The whole capitulum is covered by a chitinous membrane, with the exception only of the apex of the tergum. The shape of the valves is mostly very indistinct: though the largest specimen of Station 45 has been figured the shape of the latera is much more distinct in the smaller specimen of the same Station. Hence for the description of these valves the smaller specimen has been mostly made use of.

The scutum has the occludent margin convex and the tergal margin slightly hollowed out. The calcified part is formed of two segments united at the apex: the one (the occludent segment) is broader at the base and narrower towards the upper extremity; the other (the tergal segment) extends along the tergum, is very narrow and shows the same width over its whole length.

The tergum has the calcified part ⋁-shaped: a shorter and narrower occludent segment and a slightly broader and longer carinal segment having their point of junction at the apex of the valve. Along the occludent segment the chitinous covering forms a cushion-like investment, the free margin of which is strongly arched. The apex of the tergum is recurved, bent towards the carinal side of the capitulum.

The carina has the umbo at some distance from the apex. The part above the umbo is quite covered by the chitinous membrane, the roof of the part underneath the umbo is covered by a thin membrane only. Its width increases distinctly, but not very strongly from the umbo downwards; its margins develop into distinct ridges. The sides are rather broad especially in the uppermost part; its limits cannot, however, be made out distinctly.

The upper latus is broad, trapeziform, the tergal and basal margins running about parallel to each other. The scutal margin joins the tergal margin in a rounded or truncated angle which extends to the extremity of the tergal segment of the scutum. The umbo is near the apex.

The rostral latus is narrow or low. The basal margin is shorter than the scutal margin, the lateral margin slightly convex. The rostral margin of the two rostral latera only meet one another at the upper extremity. A triangular space remains between the two valves which is covered by chitinous membrane only: this is most probably the place for the rostrum if it were present as a calcified valve.

The infra-median latus has the umbo near the base. Its general shape is that of a tall wine-glass, almost without stalk, with a small and narrow foot and the upper part wide.

The carinal latus has the umbo at the base, projecting beyond the line of the carina. The carinal margin is strongly hollowed out; further, there can be distinguished a short and straight upper margin, a slightly hollowed out lateral margin and a somewhat convex basal margin.

The peduncle is cylindrical, compressed laterally. The scales on the surface are rather broad but not very prominent. They are numerous but they are not placed in regular longitudinal rows.

Size. The size of the largest specimen was 28 mm. total length and 21 mm. length of the capitulum.

One of the specimens is attached to a little piece of the shell of a Gastropod mollusc, the other to a small black stick the nature of which is unknown to me.

The study of the structure of the animal contained within the capitulum has yielded the following results:

Mouth. Labrum not very bullate, triangular when seen from above; teeth hardly distinguishable. Palpi rather elongate with a tuft of hairs at and near the extremity.

Mandibles with three teeth equally distant from one another; the inferior angle blunt, with half a dozen small indistinct teethlike nobs. Hardly any hairs on the surface of the mandible.

Maxillae with three stronger and one small upper spine and a notch between these and the other spines. The notch is more distinct on the maxilla of the left side. The straight part of the edge beneath the notch bears 7 or 8 spines, which are all of them smaller than the three upper spines. The surface of the maxilla bears very few and very delicate hairs on the part near the edge only. The apodeme is long and flat at the extremity.

Outer maxillae with the inner margins covered with hair-like spines and the openings leading into the body cavity at the extremity of long tubular projections.

Cirri. First pair much shorter than the five posterior pairs, seated at a little distance from the second pair. The rami of the first pair are unequal in length and breadth: the shorter has 8 segments which are oblong in a transverse direction, the longer ramus has 12 segments which are about as long as broad. The segments of the posterior cirri are elongated, the cirri strongly curved. I counted 32 segments in one of the rami of the last pair.

Caudal appendages with 8 segments; each segment bears a few very delicate hairs on the inner side near the extremity, the segments 5—8 bear moreover a very long spine-like hair on the outer side near the extremity and the broad extremity of the 8th segment supports six of these.

Dwarf males. I found six of them in the pouch on the inner side near the extremity of the left scutum; there are several in the pouch on the right side also, but I left them intact so as not to damage the specimen more than was necessary. The males have the same shape as in the nearly related species: *Sc. javanicum* etc. The shape is oval, but as the peduncular extremity is slightly thicker, the whole is somewhat pear-shaped. A rather large and very distinct opening leads into the cavity of the sac. The surface is covered with short, spinelike hairs, which are larger and more numerous at the peduncular pole. No trace of calcareous plates or valves. The longest diameter of one of the males was nearly 1 mm. (0,93 mm.).

The species was dredged at:

Stat. 45. April 6, 1899. Lat. 7° 24′ S., Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud. Two specimens.

Observations. At Station 271, December 21, 1899; lat. 5° 46′.7 S., long. 134° 0′ E.; depth 1788 m.; bottom green mud, a specimen of a *Scalpellum*-species was collected (together with three specimens of *Sc. inflatum*, mihi) which I think belongs also to the present species. It was found attached to a piece of pumice-stone and it seems to be a slightly older specimen. Its capitulum measures 27 mm., its peduncle is short and has a length of only 10,5 mm. The form of the capitulum and that of the valves corresponds with that of *Sc. chitinosum*, but the chitinous membrane covering the valves is considerably less thick: in consequence the shape of the valves can be made out much easier. The most marked difference I discovered is, that

the roof of the carina is quite flat in this specimen, there being hardly a trace of the longitudinal ridges which are distinct in the specimens of Station 45. This difference, however, is not considered by me of sufficient importance to separate from one another forms which quite correspond in other regards. Another difference is given by the two rostral latera which meet in this specimen over the whole length of the rostral margins, a rounded space in the middle of this margin only remaining uncovered by calcareous matter. A rostrum, however, could not be said to be present in this specimen either.

9. *Scalpellum inflatum* n. sp. Pl. VII, fig. 5 and 5*a*.

Valves fourteen. Capitulum bulky, swollen, covered by a thick chitinous membrane. Membranous interspaces between the valves. Umbo of the carina at some distance from the apex, the valve angularly bent in consequence. Scutum and tergum imperfectly calcified and not divided into two parts by a prominent ridge, their occludent margin strongly convex. Sides of the carina broad; upper latus pentagonal; infra-median latus elongated with the umbo near the base; carinal latus with the umbo near the base. Rostrum quite covered by membrane.

This species is represented by three specimens. It is without doubt nearly related to *Sc. compressum*, mihi, collected by the "Challenger". Its bulkiness, the structure and imperfect calcification of scutum and tergum distinguish it at once from the "Challenger" species. The specimens were covered with mud; the outlines of the valves could only be made out after cleaning the surface with a brush.

The capitulum is relatively short, about one and a half times as long as broad, also thick, swollen: its thickness is about 10 mm. in a specimen the capitulum of which measures 17,5 × 27 mm. The thick chitinous membrane which covers the valves and the interspaces between them, leaves uncovered the umbonal part of the scutum and the tergum. This chitinous membrane is very characteristically pigmented on some of the valves, the scutum especially. The chitinous interspace between the valves is particularly broad between the carina and the other valves.

The outline of the scutum is quadrangular, it is strongly bowed in transverse direction. The occludent margin is convex; where it reaches the tergum a recurved apex is formed which overlaps a part of the tergum. The calcified part consists of an elongated occludent and a short and narrow tergal segment.

The tergum is rather quadrangular than triangular. Its occludent margin is strongly convex forming with the concave uppermost part of the carinal margin a distinctly recurved apex. The scutal margin is nearly straight, the undermost part of the carinal margin which forms the fourth margin of the quadrangle is also straight. The calcified part of the tergum is V-shaped and is composed of a broader occludent and a slightly narrower carinal segment.

The carina has the umbo at some distance from the apex and the part above the umbo forming an angle with the part underneath it. A roof, slightly hollowed out longitudinally and growing rather wide towards the base of the valve, can be distinguished from the sides which are narrow at the base and of considerable width in the uppermost part.

Rostrum (fig. 5*a*) small, triangular, totally covered by thick chitinous membrane.

The upper latus is pentagonal with the sides of unequal length: the basal margin separating it from the infra-median latus is the shortest, the tergal margin the longest. The umbo is seated at a little distance from the apex.

The rostral latus is trapeziform: the scutal and basal margins run parallel, the lateral margin is convex and the rostral margin also slightly arched. The upper halves of the two rostral margins limit a small triangular space which is occupied by the rostrum.

The infra-median latus has a triangular basal part and an elongated triangular upper part. Where the two parts unite the umbo is seated. The lateral margin of this valve can not well be made out; most probably, it is slightly concave.

The carinal latus is quadrangular. The carinal margin is hollowed out, the umbo is seated at a little distance from the base. The basal margin is short, the lateral margin feebly arched, the upper margin short and straight.

The peduncle is cylindrical. The scales are narrow, laterally more strongly developed. They are placed on six longitudinal rows: one rostral, one carinal and on both sides two lateral rows. In the specimen figured there are about 9 scales in each longitudinal row.

Size. The specimen figured is the largest of the three. Its total length was 45 mm., that of its capitulum 27 mm. One of the specimens was found attached to a rounded piece of very porous stone, most probably pumice-stone, the two others to a specimen of *Sc. moluccanum*, the only one collected during the cruise of H. M. S. "Siboga".

The study of the structure of the female animal contained within the capitulum has yielded the following results:

Mouth bullate, same shape as in the other nearly related species. Second maxilla with the openings giving entrance to the body cavity at the end of long and flat tubular projections.

The first cirrus has both branches short, broad, flattened; the anterior branch considerably broader than the posterior. The second cirrus is placed at a little distance from the first with longer, cylindrical rami; the cirri of the four last pairs have very long and strongly curled rami.

The caudal appendages have six segments, the last one is abruptly cut off in a transverse direction and bears numerous hairs on the extremity.

No trace of a penis; I consider the large animals unisexual and female, the males as dwarf-males.

Four dwarf-males were found in the left pouch formed by a duplicature of the sac or mantle, at the inner side of the scutum in front of the adductor muscle. There are several in the right pouch also, but I could not count them without loosening the pouch from the scutum. The size of the males is 1 mm. in length and about 0,6 mm. in breadth; shape oval. Opening giving entrance to the sac at the capitular pole. The prehensile antennae are attached to the little body about the middle of its length. The whole surface bears minute hairs; they are longer and stouter, however, at the extremity opposite the capitular pole. A few longer, but very delicate hairs form a tuft, one at each side of the mantle- or sac-opening. The male corresponds on the whole in shape and structure with that of *Sc. javanicum*, *Sc. curiosum* etc.

H. M. S. "Siboga" collected this species at:

Stat. 271. December 21, 1899. Lat. 5° 46'.7 S., Long. 134° 0' E. Depth 1788 m. Bottom: bluish green mud of uniform appearance.

Observations. This species comes without doubt very near to *Sc. compressum*, mihi, the main difference being that the scutum and tergum do not show the prominent ridge characteristic of the "Challenger" species and are imperfectly calcified. I think it possible, however, that these differences may turn out to be of less importance than we now think, if we only had a richer material at our disposal. *Sc. compressum* was collected in the Celebes Sea at a depth of about 3900 m.

10. *Scalpellum javanicum* n. sp. Pl. VII, fig. 6, 6*a* and 7.

Valves thirteen, partly calcified, covered by chitinous membrane. Tergum strongly recurved. Carina with the umbo at some distance from the apex and the part beneath the umbo very feebly bent. Calcified part of the upper latus of an irregular triangular shape with the base of the triangle hollowed out. Calcified part of the infra-median latus wine-glass shaped. Carinal latus with the umbo at the base. Rostrum absent.

This species is represented in the collection of the "Siboga" by three specimens of different size, the largest of which has been figured. It is very nearly related to *Sc. chitinosum*, and to *Sc. japonicum*, mihi, the latter collected by the "Challenger". To the same group of species belongs *Sc. inflatum*. I describe them as so many different species though admitting the possibility that two or even more of them may afterwards turn out to represent different forms or varieties of the same species.....

The capitulum of the present form has the occludent side more strongly arched than the carinal. It is rather broad, being only one and a half times as long as broad. In consequence of the roof of the carina being of considerable breadth near the base, the capitulum is thick in the undermost part — by no means so flat as that of *Sc. chitinosum*.

The scutum much resembles the same valve of *Sc. chitinosum*. The tergal segment of the present species, however, is much shorter than in the other. The apex of the scutum is slightly produced and forms a very delicate but distinct beak which reaches to the base of the tergum.

The tergum has the calcified part ∨-shaped. Its occludent margin is very strongly arched; the carinal margin of the calcified part is distinctly hollowed out; where the two margins join the strongly recurved apex is formed. The surface occupied by the tergum in this species is smaller than the corresponding surface in *Sc. chitinosum*.

The carina has the umbo at some distance from the apex: the relation of the length of the part above the umbo to the whole carina being about 1 to 7. The part underneath the umbo is only feebly bowed and has a roof and narrow sides. The roof grows rather broad towards the base and is nearly quite flat: the ridges so distinct in many other species being but very feebly indicated. The calcified parts of the sides are narrow.

The upper latus would probably have a pentagonal shape if totally calcified. The

calcified part has a somewhat irregular triangular form, the base (the margin directed towards the carinal latus) being hollowed out, the two others margins being convex. The apex is bluntly pointed, the sharply pointed umbo lying at some distance from the apex.

The rostral latus is trapeziform: the scutal and basal margins are parallel to each other, the latter being much shorter than the former.

The shape of the calcified portion of the infra-median latus is that of á wine-glass with a very short foot. The umbo is near the base.

The carinal latus is quadrangular and has the umbo at the base of the carinal margin, where it slightly projects beyond the line of the carina. The carinal margin is hollowed out and forms with the upper margin a very sharp angle. The lateral margin is indistinctly hollowed out, the basal margin forms a sharp angle with the carinal margin.

The peduncle is cylindrical, slightly narrower at its base than at the upper extremity. The scales on the surface are rather broad and placed at considerable distances from one another. One row is exactly at the carinal side (fig. 6*a*), then there are three lateral rows on each side of the peduncle, the rostral side being occupied by two rows, the scales of which alternate vertically with one another. There are no more than five or six scales in each vertical row.

Size. The largest specimen collected by H. M. S. "Siboga" has a total length of 35 mm. the length of the capitulum being 22 mm.

I have not studied the structure of the animal within the capitulum. I found the dwarf-males lodged in a pouch, formed by a duplicature of the mantle or sac at the margin of the scutum. Each side has a pouch and in the specimen I have investigated each pouch contained two males. I believe I observed them also in the other specimens; but as I did not wish to destroy them I did not investigate very closely with regard to this point. The shape of the male (Pl. VII, fig. 7) is oval; it is rather large, the longest diameter being not quite 1 mm., the breadth about half the length. Its surface is beset with short spine-like hairs; these are more numerous and especially longer at the peduncular than at the capitular pole of the little creature. A small opening at the capitular pole gives entrance to the interior of the sac. There is no trace of real calcareous plates which would represent the valves of the male; but as the surface of the sac is naked and smooth in the immediate neighbourhood of the opening, these slightly swollen marginal parts may after all stand for rudimentary valves. So far as could be ascertained without cutting sections, the structure of this male corresponds with that of the male of *Sc. regium*, *Sc. velutinum* and other deep-sea species. Of the internal organs the male reproductive organs (testicula and receptaculum seminis) are the only ones which are in a relatively good state of development, the abdominal segments with the long spines attached to them being visible but in quite a rudimentary condition.

This species was collected at:

Stat. 18. March 18, 1899. Lat. 7° 28′.2 S., Long. 115° 24′.6 E. Depth 1018 m. Bottom: fine grey mud. Three specimens.

11. *Scalpellum curiosum* n. sp. Pl. VII, Fig. 8, 8*a* and 8*b*.

Valves fourteen, imperfectly calcified, covered by a thin chitinous membrane. Calcified

part of the scutum with a lateral lobe along the tergal margin. Tergum V-shaped. Carina simply bowed with the umbo at a short distance from the apex. Upper latus irregularly pentagonal. Infra-median latus irregularly wine-glass-shaped. Rostrum small triangular.

This species is represented by a single specimen only.

The capitulum has an elongate oval shape, sloping gradually into the peduncle. The valves are separated by chitinous interspaces, their colour is not white but yellowish; they are covered by a thin chitinous membrane. The occludent margins of scutum and tergum form together a continuous arch; the apex of the capitulum is distinctly recurved.

The imperfectly calcified scutum consists of an elongate occludent segment, which is broadest at the base and a narrow tergal segment.

The tergum consists of two segments of about the same width, the carinal segment being much longer than the occludent segment. Apex pointed, distinctly recurved.

Carina simply bowed, for $^5/_6^{\text{ths}}$ of its length with a flat roof bordered on each side by a ridge. The remaining $^1/_6^{\text{th}}$ is between the umbo and the apex of the valve and is not flat but bowed laterally.

Upper latus irregularly pentagonal with the tergal margin longest and the umbo pointing in the direction of the tergal segment of the scutum.

Of the valves of the lower whorl, the triangular rostrum (fig. 8*a*) is by far the smallest, the carinal latus the largest. The latter valve has the umbo at the outer angle beneath the carina. The infra-median latus is relatively large; it is wine-glass-shaped, the umbo being placed below the middle and the main growth being upwards. Rostral latera nearly twice as long as broad, umbo placed at the corner where scutum, rostrum and rostral latus are nearest to one another. The exact shape of the valves may for the rest be judged from the drawing (Pl. VII, fig. 8*b*).

Peduncle with the upper end widest, slightly narrower at the base, flattened, more than half as long as the capitulum. Scales large, placed transversely, not numerous, forming together about 7 longitudinal rows. The scales are much nearer to one another in the upper end than downwards.

Size. The total length of the specimen was 13,7 mm., that of the capitulum alone 8,7 mm.

The only specimen was loose — to judge from the objects taken along with it I imagine that it has been attached to a shell or piece of stone.

Complemental male not observed.

The specimen was collected at:

Stat. 45. April 6, 1899. Lat. 7° 24′ S., Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud, with some Radiolariae and Diatomeae.

Observation. At the same Station 3 other species of *Scalpellum* were collected, viz. *Sc. polymorphum*, *Sc. chitinosum* and *Sc. crinitum*.

12. *Scalpellum polymorphum*. Pl. VII, fig. 9—11.

Valves fourteen, covered by membrane, imperfectly calcified in some of the specimens. Carina simply bowed, roof bordered on each side by a strongly developed ridge; umbo very

near the upper extremity of the valve. Rostrum narrow, partly covered by the lateral parts of the rostral latera. Infra-median latus elongate, rhombiform, with the umbo near the base. Carinal latus quadrilateral with the umbo quite at the base projecting beyond the line of the carina.

A perfectly calcified specimen (Pl. VII, fig. 9) of this form (form A) was collected at Station 256, another (form C) very imperfectly calcified (fig. 11) at Station 45. I would not have considered these two forms as belonging to the same species, but for the occurrence of a third form (form B: fig. 10) — collected also at Station 45 — to a certain extent intermediate between the two. A fourth specimen from the same Station 45 is exactly like that of fig. 11. It exhibits, however, what the specimen I have figured does not, the margins of the valves, and shows that these have exactly the shape of the corresponding valves in the other specimens I have at my disposal.

The capitulum is broad, oval, with the carinal side more strongly bowed than the occludent side. The apex is not very strongly recurved. The valves of the lower whorl increase in height from the rostral to the carinal side of the capitulum.

The scutum is perfectly calcified in all the specimens. It varies slightly in shape, as is shown by the figures 9—11 of Pl. VII, being at the tergal extremity narrower in the one specimen than in the other. The occludent margin is more or less strongly convex, the lateral margin hollowed out near the upper extremity. The basal and lateral margins describe together one continuous bow. The tergal and occludent margins meet at the apex and form a small pointed projection which overlaps the tergum.

The tergum is triangular. It has a convex occludent margin, whereas its carinal margin is slightly hollowed out in the upper and slightly convex in the lower half of its length. The scutal margin is nearly straight in the specimen with perfectly calcified valves; it is distinctly concave in the intermediate form (fig. 10) and hollowed out over three quarters of its length in the specimens with imperfectly calcified valves.

The carina is rather strongly bowed; its roof is deeply notched longitudinally. Its sides are broadest in the specimen with perfectly calcified valves and much narrower in the other specimens. A broad stripe of chitinous membrane fills the interspace between the carina and the other valves in these specimens. Another difference is that the umbo in the specimen from Station 256 is quite at the apex, and at a little distance from the apex in the specimens with less perfectly calcified valves.

The upper latus is pentagonal with the umbo at the apex. Beyond the umbo the apex is slightly more produced in the specimens with imperfectly calcified valves than in the others. In the latter the two basal margins are straight, in the others these margins are distinctly excavated.

The rostrum (fig. 9*a*) is very narrow and on both sides covered by the rostral latera.

The rostral latus is quadrilateral with the rostral margin much shorter than the lateral.

The infra-median latus is rather large, broad and flat at the upper extremity, much narrower at the base. The umbo is seated near the base at the tip of a triangular projection, which is slightly raised over the narrow base of the valve.

The carinal latus has a quadrangular shape when perfectly calcified, with the carinal

and basal margins meeting at the umbo and forming a sharp angle projecting beyond the line of the carina. The lateral and upper margins are of about the same length and meet at a very obtuse angle. In the specimens with imperfectly calcified valves, the calcified part has the form of a chinese boot, the part that is not calcified having the shape of a rectangular triangle.

The peduncle is cylindrical and shows 8 to 12 longitudinal rows of scales. In the specimens with perfectly calcified valves these scales are perhaps distributed slightly more regularly than in the others.

Size. The specimens figured measure 20, 19 and 26,6 mm.; their capitulums 13,3, 13,8 and 16,2 mm.

The study of the structure of the animal contained within the capitulum has yielded the following results:

Mouth triangular when seen from above, slightly bullate. Labrum with hardly distinguishable teeth; palpi conical, rather pointed at the extremity, with short and not numerous hairs, those on the apex little longer.

Mandibles with three teeth, which are pointed at the extremity and slightly swollen a little before the extremity; the inferior angle is blunt and furnished at the under side near the extremity with about four triangular, small, sharp teeth. Teeth 2 and 3, and 3 and inferior angle at shorter distances from one another than teeth 1 and 2. Near the inferior angle the surface bears a few very delicate hairs placed in groups of three or four. Along the under margin are planted short hairs.

Maxillae rather narrow; edge with a very distinct notch, a little above the middle; three strong spines, of which the first is the strongest, above the notch; one spine in the notch and 7 to 8 rather strong spines, which do not differ much from one another in strength, beneath the notch. The surface of the maxilla bears delicate hairs, partly in groups, on the distal extremity only. Apodeme broad, not very long.

Second maxillae of the ordinary shape, with hairs along the outer and inner side and also at the apex; a long tubular process, which is flat and truncated at the extremity, gives entrance to the body cavity.

Cirri. First pair at some distance from the second pair; rami unequal: the anterior shorter and broader, the posterior longer and narrower. Both rami have a long basal segment, which is indistinctly divided into smaller segments; the short ramus has moreover 4, the long ramus 8 distinct segments. Along the sides of the more or less flattened segments stout spines are planted on knobs; more slender spines or hairs are scattered all over the surface of the segments.

Second cirrus with about 20 segments in each ramus: the first segment is long and consists of several segments fused together; the following segments short, quadrangular, gradually growing longer, the last being as long as the foregoing ones but considerably narrower. Spines on the anterior side stouter and planted on knobs: four pairs on each segment as a rule; those on the posterior side more delicate, less numerous and not placed so regularly.

Sixth cirrus having in each ramus a long basal segment consisting of several segments fused together and about 25 clearly distinguishable segments. These grow gradually longer and narrower from the base to the extremity. Each segment bears, as a rule, 4 pairs of long spines

on the front side and one or two very short spines on the posterior margin near the extremity. The latter margin in some of the segments bears a spine at about the middle of its length; this margin, moreover, is delicately hirsute with extremely short hairs or teeth.

Caudal appendages long, consisting of 8 narrow segments. Each segment bears one longer hair near the extremity; those on the six last segments are very long, very stout and distinctly serrated. On the interior margin each segment has one or two much more delicate hairs. The last segment bears a group of three very long, feathered hairs or spines at the extremity.

No penis.

Male. I found only one male on the specimen I investigated more closely in this regard: it was the specimen with partly calcified valves represented on Pl. VII in Fig. 11. I found it on the inner side of the left scutum, near the occludent margin. It was not in a very good state of conservation, the body with the cirri hanging out of the opening of the sac. The longest diameter of the sac was about 1,2 mm., the breadth slightly over 0,5 mm. The sac or mantle itself was very thin and soft, not resistant, tough. About the middle of the longest diameter little prehensile antennae are attached. The surface shows numerous very short hairs, arranged in transverse rows, placed at short distances from one another.

This species was taken at the following places:

Stat. 45. April 6, 1899. Lat. 7° 24′ S., Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud. One almost perfectly, two imperfectly calcified specimens.

Stat. 256. December 11, 1899. Lat. 5° 26′.6 S., Long. 132° 32′.5 E. Depth 397 m. Bottom: greyish green mud. One perfectly calcified specimen.

Affinities. This very interesting species is perhaps more closely allied to *Sc. rutilum* Darwin than the descriptions of the two species would at present lead us to suppose. It is also similar in several regards to *Sc. distinctum* Hoek.

13. *Scalpellum distinctum* Hoek. Pl. VII, fig. 12.

HOEK, Cirripedia collected by H. M. S. "Challenger". 1883. p. 111, pl. VI, fig. 10 & 11.

H. M. S. "Siboga" collected a *Scalpellum* at three different Stations which I think is identical with the above-named species. The very curious forms of the scutum, the upper latus and the infra-median latus leave no doubt on the matter.

Yet the resemblance is not absolute and I have therefore thought it useful to give a figure of one of the "Siboga" specimens. The original description was given from a single specimen, a circumstance which of course makes that description less reliable.

The smallest of the two specimens collected by the "Siboga" (total length 20 mm., length of the capitulum 14,4 mm.) has been figured. (The capitulum of the "Challenger" specimen had a length of 15,5 mm. and that of the largest "Siboga" specimen 19 mm.). Comparing the figure with that given in my "Challenger" Report (Pl. VI, fig. 10) one is struck with the much more prominent lines of growth and ridges on the valves of the "Challenger" specimen. To some extent this is the fault of the lithograph: on the original pencil-drawing these lines are much more delicate; on the upper part of the infra-median latus they are however stronger developed in the "Challenger" than in one of the "Siboga" specimens.

The same is the case with the ridges along the roof of the carina: these ridges are by no means so distinct in the "Siboga" specimens as in that of the "Challenger". I should mention also that the scales of the peduncle which in the "Challenger" specimen are placed in not very regular rows, in the largest "Siboga" specimen may be said to form longitudinal rows; in the smaller specimen, however, this can hardly be said.

With regard to the shape of the carina I found that this species belongs also to the Sectio C: the umbo of the carina is not quite at the apex of the valve, but at a short distance from it. In this regard it much resembles *Sc. polymorphum* with which it corresponds also in several other regards.

Finally I must point out, that the chitinous interspaces between the valves which were rather broad in the "Challenger" specimen, are much more prominent in the larger "Siboga" specimen (from Station 175) than in the smaller (the one figured) which was taken at Station 208.

The structure of the animal of the only specimen taken by the "Challenger" was not studied; I have thought it useful, therefore, to examine one of the "Siboga" specimens.

Mouth not very bullate; crest of the labrum with a row of very small knobs at the place of the teeth; palpi conical, rather small, with a group of short bristles at the tip and a couple of very short spines on the internal margin about the middle of its length.

Mandibles with three teeth; distance between 1 and 2 slightly greater than that between 2 and 3; inferior angle close to tooth 3, short, rounded and delicately pectinated. Short hairs are planted along the under margin.

Maxillae with a not very distinct notch about or a little above the middle of the edge; above the notch three unequal spines, in the notch (or as fourth spine above the notch) one spine; beneath the notch six spines. Apodeme stout, rather long and broader at the extremity.

Outer maxillae rounded, with the bristles divided into two separate tufts; the orifice giving entrance to the body cavity at the end of a long and flat process, transversely cut off at the extremity.

Cirri. First pair short, not separated from the second by an interspace; rami unequal in thickness and slightly in length; the shorter ramus has about 8 broad, the longer 10 more cylindrical segments. The first segment in both rami is much longer than the others, the last one considerably shorter. In both rami the segments are thickly clothed with spines.

Second cirrus (in the specimen investigated) both rami broken off at one side, and one ramus broken off at the other side. The only remaining ramus has 17 segments, the first of which is rather long, the following nearly quadrilateral, the last ones cylindrical and much narrower.

Sixth cirrus has 22 segments in both rami: the first one very long, then come four or five nearly quadrangular segments, the following nine growing longer and narrower, the 14th being the longest of all and nearly five times as long as broad. The last segments grow still narrower but diminish in length: the last is very narrow and tapers towards the extremity, where three short spines are planted. The number of pairs of spines found on the front side of each segment is from three to seven; this number is largest at the 14th segment.

Caudal appendages long and narrow, tapering towards the extremity and consisting of 5 (left side) or 6 (right side) segments, of which the penultimate is the longest. Near the

end of most segments are planted a few delicate hairs, one of those found at the tip of the last segment being much stouter and more than twice as long as the last segment. This hair is very distinctly barbed or feathered.

No penis.

Dwarf males. I found three on the left and two on the right side of one of the specimens. They are lodged in a pouch formed by the mantle along the inner side of the scutum, near the occludent margin, slightly in front of the adductor scutorum muscle. They have the ordinary shape and structure; their size is 0,8 × 0,5 mm. The antennae are situated at about $^1/_3{}^{rd}$ the length of the animal from the posterior extremity, the anterior extremity or pole being considered to be where the large opening which gives entrance to the sac is found. No trace of calcareous plates or rudimentary valves. Surface covered with very small hairs or spines, arranged on transverse rows all over the surface. The transverse rows are very close to one another and numerous. A few slightly longer hairs are planted on both sides of the longer axis of the oval opening of the sac. Of the interior structure are seen the rather large testicula, the pointed extremities of which are directed towards the posterior pole of the body; then the receptaculum seminis densely filled with threadlike spermatozoids; cement-glands at the base of the antennae; a rudimentary thorax and abdomen bearing long spine-like hairs at the extremity. The latter represent the cirri and are directed towards the opening of the sac.

The "Challenger" took a specimen of this species in the neighbourhood of the New Britannia Archipelago, east of New Guinea; H. M. S. "Siboga" collected specimens at the following places:

Stat. 88. June 20, 1899. Lat. 0° 34′.6 N., Long. 119° 8′.5 E. Depth 1301 m. Bottom: fine, grey mud. One specimen.

Stat. 175. Aug. 30, 1899. Lat. 2° 37′.7 S., Long. 130° 33′.4 E. Depth 1914 m. Bottom: fine, grey and green mud. One specimen, attached to the shell of a Gastropod.

Stat. 208. Sept. 22, 1899. Lat. 5° 39′ S., Long. 121° 23′.5 E. Depth 2218 m. Bottom: grey mud. One specimen, a small one, attached to a chitinous tube, the skin of the siphon of a Lamellibranchiate Mollusc most probably.

Observations. This species is nearly related to the foregoing: *Sc. polymorphum*. The form of the scutum and of several other valves, however, show its distinctness.

D. Sectio: **Arco-Scalpellum**

14. *Scalpellum moluccanum* Hoek. Pl. VII, fig. 13.

HOEK, Cirripedia collected by H. M. S. "Challenger". 1883, p. 104; pl. V, figs. 3, 4.

H. M. S. "Siboga" collected one specimen of a *Scalpellum* species which I think must be referred to this species. To the left side of this specimen two rather large specimens of the species which I have proposed to call *Sc. inflatum* (p. 76) were found attached and in consequence of this the specimen is slightly abnormal in shape. The carina especially has grown quite asymmetrical making it difficult to judge its original shape.

The specimen belongs certainly to the group of species: *Sc. regium*, *Sc. Darwini* and *Sc. moluccanum* which are nearly related to one another. It comes nearest to *Sc. moluccanum* and as it was taken at about the same locality (see below), I may be entitled to consider it

as belonging to that species. The description of the "Challenger" specimen was given from a single specimen.

The valves of this specimen are to a large extent covered by chitinous membrane, leaving (exactly as in the specimen of *Sc. moluccanum*, described in the "Challenger" report) the apices of the valves uncovered. This membrane was moreover wanting on the left side of the capitulum, at the places from which I had removed the other Scalpellums. Continuing to take away this chitinous membrane I discovered that the area of each valve was distinctly limited by a clear line and that the calcareous valve only occupied a part of that area: only after this chitinous covering was removed was it possible to make out the exact shape of each valve. To decide whether *Sc. regium* and *Sc. moluccanum* are really different species, and also to which the present specimen belongs, it would by all means be necessary to deal with the type specimens as I have now done with the "Siboga" *Scalpellum*. Fig. 13 of Pl. VII represents that specimen, seen from the left side after the chitinous covering was removed from the capitulum.

Whereas the "Challenger" took the species at Lat. 4° 21′ S. and at Long. 129° 7′ E. from a depth of 1425 fathoms (about 2565 m.), H. M. S. "Siboga" collected it at:

Stat. 271. December 21, 1899. Lat. 5° 46′ S., Long. 134° 0′ E. Depth 1788 m. Bottom: bluish green mud of a uniform appearance.

15. *Scalpellum hamulus* n. sp. Pl. VII, fig. 14 and 14*a*.

Surface of the capitulum and of the peduncle covered by a thin membrane with very short hairs. Valves fourteen. Carina simply and strongly bowed with a nearly flat roof which is very wide at the base. Upper latus very narrow at the base. Rostrum triangular. Valves of the lower whorl small with exception of the rather well developed carinal latus. Umbo of the latter at the upper extremity.

This beautiful species is represented by one specimen only.

The capitulum is rather robust, thick especially in the under part; it is of an elongate oval shape with the apex slightly produced. The valves of the lower whorl are relatively small, the carinal latus excepted. The valves touch each other and are covered by a membrane which is clothed with short hairs.

The scutum is very broad at the base, the lateral margin not beginning above the apex of the infra-median latus (as is the rule in this genus) but above the middle of the upper margin of the carinal latus. Apex produced; tergal margin slightly hollowed out; occludent margin convex. Not quite twice as long as broad.

The tergum is likewise rather broad. It has the scutal margin convex and the occludent margin also convex. The apex is slightly produced and terminates in a short but rather sharp and feebly recurved point.

The carina is simply bowed with a nearly flat roof widening very considerably from the apex to the base. The roof is slightly convex laterally and its borders insensibly pass over into the rather narrow side parts.

The upper latus is of a triangular shape with the umbo at the apex fitting into the angle formed by the lateral margin of the scutum and the scutal margin of the tergum. The

carinal margin describes a curve, that part which represents the basal margin of the same valve in other species being very short.

The rostrum (fig. 14*a*) is small, triangular, with the base directed towards the peduncle. Its apex separates the two umbones of the rostral latera from one another; though small the rostrum is distinctly visible at the surface.

The rostral latus is extremely low, its scutal and basal margins running nearly parallel to each other.

The infra-median latus is also small. It has a triangular shape with the umbo at the apex.

The carinal latus has a convex carinal and a hollowed out upper margin; where they meet the umbo is seated; that part projects outwards and forwards.

The peduncle is robust, cylindrical and rather long, being about $^{2}/_{3}^{rds}$ as long as the capitulum. It is covered by prominent scales placed in five longitudinal rows.

Size. The length of the animal is 30 mm., that of the capitulum 19 mm.

The specimen representing this species was collected by the "Siboga" at:

Stat. 256. December 11, 1899. Lat. 5° 26′.6 S., Long. 132° 32′.5 E. Depth 397 m. Bottom: greyish green mud.

Observation. This species is no doubt nearly related to the Atlantic species *Sc. velutinum* Hoek. Yet it can be easily distinguished from that species by the form of the upper latus, by the rostrum and by the shape of the carinal latus. It belongs to the same group of species as *Sc. diota* n. sp. but the rostrum and the infra-median latus of the latter species are so different that there can be no question, I think, of these two forms being distinct.

16. *Scalpellum diota* n. sp. Pl. VII, fig. 15 and 15*a*.

Valves 14, covered with hairy membrane. Carina simply bowed, large. Valves of the lower whorl small, increasing in height from the rostral to the carinal side of the capitulum. Carinal latus with the umbo at the strongly recurved apex.

This species is represented by one specimen only.

Capitulum with the occludent margin nearly straight and the carinal margin very strongly convex, with the upper valves large and those of the lower whorl small. The colour of the specimen (in spirits) is light pink, large red spots being observed along the margins of the larger valves etc.

Scutum quadrilateral, not quite twice as long as broad. Occludent margin nearly straight, lateral margin convex, apex produced, pointed, slightly overlapping the tergum.

Tergum large, triangular. Occludent margin nearly straight; apex pointed, slightly produced, hardly curved towards the carina.

Carina simply bowed, roof flat, a depression being only visible at the base between the two carinal latera. The roof increases in width very considerably from the apex to the base. Sides flat, rather narrow.

Upper latus triangular with the umbo at the apex, this part acuminated fitting into the angle between the scutum and the tergum. Lateral margin concave, carino-lateral margin strongly convex and divided into two unequal parts by the recurved apex of the carinal latus.

Rostrum (fig. 15*a*) very small, elongate, not triangular, laterally covered by the rostral latera.

Rostral latus quadrangular, low, with the lateral margin only slightly longer than the rostral margin.

Infra-median latus small, narrow, slightly increasing from the recurved apex to the base. Umbo at the apex.

Carinal latus with the umbo at the strongly recurved apex. The carinal margin is convex, the upper lateral margin hollowed out.

Peduncle short, flat cylindrical, only $^1/_3{}^{rd}$ of the length of the capitulum. Scales rather large, placed in five longitudinal rows.

Size. The total length of the specimen is 10 mm., that of the capitulum about 7,5 mm.

The specimen representing this species in the collection of the "Siboga" was taken at:

Stat. 251. December 8, 1899. Lat. 5° 28'.4 S., Long. 132° 0'.2 E. Depth 204 m. Bottom: hard coral sand.

Observations. This species is nearly related to *Sc. hamulus* as also to *Sc. rubrum* Hoek which was taken by the "Challenger" near Luzon, at a depth of 180 to 207 m. There are however small differences in the shape of the valves, of the rostrum especially, as also in the size and number of the scales of the peduncle. The description of *Sc. rubrum* was also given from a single specimen; its capitulum measured only 5 mm.

17. *Scalpellum sessile* n. sp. Pl. VII, fig. 16.

Valves thirteen, not covered by membrane. Carina short, simply bowed with the umbo at the apex, no flat roof, but laterally bowed. Upper latus trapeziform. Valves of the lower whorl large. Infra-median latus triangular, with the umbo at the apex and a rather broad basis. Carinal latus very large, pentagonal, with the umbo at the upper extremity.

This species is represented by four specimens, one being very small.

The capitulum is rather thick, with the carinal margin much more bowed than the occludent margin. No membrane covers the valves. Whereas the valves of the lower whorl are large, the scutum, tergum and carina are relatively small, the upper latus medium-sized. The valves nearly touch each other; they cannot be said to be separated by chitinous interspaces. The length of the capitulum is twice the breadth it has in the middle, a little above the base of the carina.

The scutum is about twice as long as broad. The occludent margin is hollowed out in the lower and convex in the upper part; the apex is produced, the tergal margin much longer than the basal margin. The lateral margin is more than half the length of the occludent margin.

The tergum is triangular; its three margins, the carinal being the longest, are convex.

The carina is short, simply and rather strongly bowed, with the umbo at the apex. Roof and sides are not separated by ridges, the dorsal surface of the valve being laterally bowed.

The upper latus is trapeziform. There is a short but distinct carinal margin, the length of which is about one fourth that of the scutal margin. The scutal and basal margins meet together at a rather sharp angle.

The rostral latus quadrangular. Basal and scutal margins nearly parallel to each other, the second twice as long as the first. Rostral margin nearly straight and only a trifle shorter than the slightly convex lateral margin.

The infra-median latus is triangular, with a well-developed basal margin and the umbo at the apex. Its rostral margin is slightly hollowed out, its carinal margin slightly convex.

The carinal latus is very large and has an irregular pentagonal shape. Its carinal margin is divided into two: a large part meeting that of the same valve of the other side along the whole length and a very short part separating the valve from the carina. The latter margin forms an angle with the upper margin and here the umbo of the valve is situated. Upper and lateral margins of about the same length; basal margin very short.

The peduncle is short and has a conical shape. The surface is covered with rather large scales, which are chitinous but not very prominent. They are placed in seven not very distinct longitudinal rows.

Size. The specimen figured Pl. VII, fig. 16 has a total length of 5,2 mm., the length of the capitulum being 4 mm. They were found attached to a small stem of what I take to be a calcareous coralline.

The study of the structure of the animal within the capitulum has yielded the following results:

Mouth seen from above triangular, with the part directed forward rounded and bullate. Labrum with a row of small but distinct teeth; palpi conical with a tuft of spines at the tip and a row of half a dozen shorter spines or hairs along the outer margin.

Mandibles with three teeth; the distance between the extremities of tooth 1 and 2 twice as great as that between tooth 2 and 3. Inferior angle pectinated and at a very short distance from tooth 3. The upper margin of tooth 3 shows traces of being pectinated — showing agreement with *Sc. balanoides* Hoek also in this regard.

Maxillae with the outer edge deeply notched about the middle; above the notch 4 spines, two of which are longer; beneath the notch the edge bears 5 or 6 spines and is slightly protuberant.

Second maxillae not larger than usual and of the ordinary shape; spines in three groups, with some distance between two; openings giving entrance to the body-cavity at the tip of a swelling — not at the end of a tubular process.

Cirri. First pair close to the mouth and at some distance from the second pair. Rami unequal: shorter ramus slightly broader, composed of 5 or 6 segments; longer ramus more elongated, having 7 segments. In both rami the limits of the segments are indistinct; they bear numerous hairs, partly at the surface, partly along the margins.

Second cirrus also has unequal rami; the segments of both rami are cylindrical but the longer one has eleven, the shorter only nine segments.

Sixth cirrus (like the 3rd—5th) not very elongated with nearly equal rami of 16

segments. Several segments have only two pairs of spines at the anterior margin: one pair very long near the extremity and a second shorter pair about the middle of its length.

Caudal appendages very minute, one-jointed with a few spines near the extremity and a short and feeble claw-like spine at the tip.

No penis.

The eggs formed a single cluster in the specimen I opened; they had a much more elongated shape than in several other species of *Scalpellum*. They measured 0,47 × 0,27 mm., their number being 17.

This specimen was furnished with a dwarf male at one side only. The latter was attached to the inner surface of the scutum near the occludent margin. Its shape was pear-like, the peduncular pole being considerably the narrower. It showed no trace of valves. The prehensile antennae were inserted very near the peduncular extremity. Its size was 0,5 × 0,3 mm.

The "Siboga" collected this interesting little species at:

Stat. 241. December 1, 1899. Lat. 4° 24'.3 S., Long. 129° 49'.3 E. Depth 1570 m. Bottom: dark sand with small stones.

Observation. This species is very nearly related to *Sc. balanoides* Hoek collected during the cruise of the "Challenger" at Lat. 5° 42' S., and Long. 132° 25' E. at a depth of 129 fathoms, about 230 m. The latter species has about the same size and lives attached to the arms of *Metacrinus Murrayi*. *Sc. sessile* differs from it, 1° by the trapezoid not triangular form of its upper latus; 2° by the greater breadth of its infra-median latus; 3° by the form of its carinal latus, which in *Sc. balanoides* has the apex, where the umbo is, produced and even slightly recurved; and 4° by the shape of the carina, which is much more strongly bowed in *Sc. sessile* than it is in *Sc. balanoides*. Perhaps on closer examination of the "Challenger" form at least some of these differences might turn out to be not so important as I must consider them now.

18. *Scalpellum ciliatum* n. sp. Pl. VII, fig. 17.

Valves fourteen, covered by membrane, clothed with very long hairs. Carina simply bowed, no flat roof. Tergum very large. Valves of the lower whorl small. Upper latus indistinctly quadrangular. Rostrum small, triangular.

This very small species is represented by a single specimen only.

The capitulum elongated, with the apices of the tergum and scutum produced. The hairs which clothe the membrane are longest along the carinal margin of the capitulum.

The scutum is elongated, quadrilateral, more than twice as long as broad, with the upper part produced and pointed.

The tergum is large, elongated rhomboid; the umbo is at the apex which is bluntly pointed and not produced.

The uppermost (umbonic) parts of scutum and tergum are naked, not covered by membrane.

The carina is simply bowed longitudinally and also laterally. It reaches to about half the length of the carinal margin of the tergum.

The upper latus has the scutal margin parallel to the occludent margin of the scutum and its apex is not produced. The carinal and basal margins form together an arch.

The rostrum is very small, triangular, with the base of the triangle directed towards the scuta.

The rostral latus is quadrangular with the longer scutal and shorter basal margins parallel.

The infra-median latus is triangular; umbo at the upper extremity.

The carinal latus has a pentagonal shape with the umbo at the upper extremity, at the angle formed by the carinal and upper lateral margin.

The peduncle is cylindrical and relatively short; the scales are placed in transverse rows and are large and of an irregular shape; they seem to be broken off from the lower part of the peduncle.

Size. Length of the capitulum 3,4 mm., of the whole animal 4,7 mm.

This species was taken at:

Stat. 227. November 13, 1899. Lat. 4° 50'.5 S., Long. 127° 59' E. Depth 2081 m. Bottom: grey mud with an upper layer of brown, both mixed with sand. One specimen.

Observation. This species is, most probably, nearly related to *Sc. hirsutum* Hoek collected by the "Challenger" at a depth of 1500 m. between Celebes and Halmaheira. There are, however, several more or less important differences between the two forms, which I think make it preferable to consider them as distinct; e. g. in the shape of the scutum, tergum and upper latus, but especially in that of the carina and the rostrum. As *Sc. hirsutum* has a capitulum of 6 mm. and *Sc. ciliatum* of 3,4 mm. only, the latter may be found to represent a not quite full-grown stage of the first — a somewhat richer material, however, is necessary to make this out.

19. *Scalpellum pellicatum* n. sp. Pl. VII, fig. 18, 18*a* and 19.

Valves fourteen, covered by membrane of a velveteen appearance. Carina simply bowed, roof nearly flat not bordered by ridges; apex projecting freely. Upper latus quadrangular. Rostrum triangular. Infra-median latus triangular. Carinal latus with the umbo projecting beyond the line of the carina.

This species is represented by one large, one fairly large and half a dozen small specimens. The largest specimen is figured.

The capitulum is white, covered by a membrane which bears short hairs standing off from the surface and thus giving it a velveteen appearance. Most of the valves are separated from one another by chitinous interspaces. The capitulum is broadest at its base, its length is less than one and a half times the breadth.

The scutum is quadrangular; the occludent margin is slightly convex, the basal and lateral margins are nearly straight, the tergal margin slightly hollowed out and forming with the occludent margin a slightly recurved apex.

The tergum has the carinal margin divided into two parts: a larger lower part which is convex and a shorter upper part which is straight. This upper part of the carinal margin runs parallel to the scutal margin: hence the whole valve has the shape of a parallelogram.

The carina is simply and strongly bowed and has the umbo at the apex which projects freely beyond the carinal margin of the tergum. The roof of the carina is broad at the base,

the sides are best developed in the under part of the valve; the angle the roof forms with the side is greater than 90°.

The upper latus is quadrangular and rather large. The angle formed by the scutal and basal margins is truncated. The umbo is near the angle the scutal margin forms with the tergal. The carinal margin is the shortest.

The rostrum is triangular with the apex directed to the base of the scuta. There is a narrow but distinct chitinous interspace between the rostrum and the rostral margins of the rostral latera.

The rostral latus is broad but very low; the scutal margin runs parallel to the basal margin, the short lateral and rostral margins are both convex.

The infra-median latus is triangular, the umbo is at the apex which is distinctly curved towards the rostral side of the capitulum: the rostral margin is hollowed out, the carinal margin distinctly convex.

The carinal latus is pentagonal, the carinal margin being divided into two parts. The upper part is hollowed out, the lower convex. Where they meet the umbo is seated: a pointed and slightly recurved triangular part projects beyond the line of the carina. The basal, lateral and upper margins of the carinal latus are of about the same length.

The peduncle is cylindrical, bent towards the rostral side. It is broadest where it is attached to the capitulum and is laterally compressed and conical in the upper part. It is covered with a hairy transparent membrane through which the scales are visible. They are placed at some distance from one another and are arranged in seven or eight longitudinal rows.

Size. The capitulum of the largest specimen had a length of 27 mm. The total length was about 40 mm.

According to the label the larger specimen of this species was found attached to a specimen of *Culeolus thysanotus* Sluit. This was collected at Station 94. The smaller specimens are attached to one another, as also to a small black coloured stick or spine, the nature of which is unknown to me.

The study of the structure of the animal contained within the capitulum has yielded the following results:

Mouth seen from above triangular, with the apex of the triangle directed towards the adductor muscle; the prominence on which the mouth is situated is not very elevated in this species.

Labrum with extremely small teeth along the edge; palpi short, broad at the base, triangular, with the apex rounded. The inner margin is furnished with numerous hairs growing slightly longer and more numerous towards the apex.

Mandibles with three teeth and the inferior angle; the latter delicately pectinated on both sides, but especially so along the interior margin; a slightly broader spine or small tooth at the tip of the inferior angle. The distance between tooth 1 and 2 about twice as long as that between 2 and 3, or 3 and the inferior angle. Surface of the exterior part with numerous delicate hairs, placed in groups of two or three.

Maxillae have the edge without distinct notch, but with a little excrescence bearing two spines at the tip at about one fifth of the length of the edge from the inferior angle.

Spines numerous and of nearly equal size, the only exception being the upper spine which is considerably stronger. Only a small part of the surface, near the exterior edge, is covered with delicate hairs which are placed in groups of two or three.

Second maxillae with the inner margin distinctly divided into two rounded parts each bearing a group of delicate spines. Outer surface curved and also bearing numerous spines; opening giving entrance to the body-cavity on a small rounded knob.

Cirri. First pair placed at some distance from the second, close to the mouth; rami short and unequal. The anterior is the shortest and has eight to nine segments, most of them being much broader than long; posterior ramus has eleven to twelve segments which are nearly as long as broad, the last being nearly spherical. Surface of all the segments covered with hairs, the distal segments being more densely clothed than the basal. Several hairs, on the distal segments of the longer ramus especially, long and irregularly curled.

Second pair longer than the first pair; shorter, however, and more robust than the cirri of pair 3—6. Longest ramus has 24 segments: the first 10 nearly quadrangular, next come 8 longer segments, which are about twice as long as broad, finally 6 segments which are narrower, but slightly longer than broad. Shortest ramus having 22 segments, 11 of which are nearly quadrangular, 5 cylindrical and 6 much narrower and shorter. Spines on the front side: 3 or 4 pairs on the middle segments, 1 or 2 pairs on the distal segments; on the posterior side: groups of 4—6 stouter and a few more delicate spines on each segment near the extremity.

Sixth cirrus long, slender, 28—29 segments in each ramus. Segments 1—8 nearly quadrangular, 9—20 cylindrical, the longest about twice as long as broad; segments 21—29 narrower, not much shorter than the middle ones. On the front of each segment are 4 to 5 pairs of spines, on the dorsal side groups of three or four spines, of which one or two are stronger, near the extremity of each segment.

Caudal appendages (Pl. VII, fig. 19) 4-jointed with a long and very broad basal segment and three minute distal segments; extremely short hairs along the interior margin of segment 1, 2 and 3 and at the extremity of 4.

Penis short, about twice as long as the caudal appendages, cylindrical, conical at the extremity; indistinctly ringed and having short hairs spread over its surface.

Complemental males. I observed on the right side of the hermaphrodite animal one, and on the left side two small males. They are very small (0,6 × 0,4 mm.), have a short-oval shape and are lodged in a pouch formed by a duplicature of the mantle, which at that place is rather thick and little transparent. The sac or mantle which covers the little male has the surface covered with minute particles of sand or mud, whereas the hairs which ordinarily occur could not be made out. Near the opening of the sac only some very short spines were seen which seemed to be inserted on the tip of a couple of small excrescences.

The Stations where this species was collected are:

Stat. 94. June 26, 1899. Lat. 5° 11′.2 N., Long. 119° 35′.4 E. Depth 450 m. (chart). Bottom: apparently sand and stone.

Stat. 256. December 11, 1899. Lat. 5° 26′.6 S., Long. 132° 32′.5 E. Depth 397 m. Bottom: greyish green mud.

Observation. In the smaller specimens the breadth of the capitulum at the base is about the same as at the height of the upper latus. In these the carinal margin of the tergum is not so distinctly divided into two parts, the apex of the carina does not project freely and the umbo of the carinal latus is not seated at the tip of a triangle which projects beyond the line of the carina. As I feel convinced that these smaller specimens, some of which were attached to the larger, belong to this species, I am inclined to admit that several of these differences result from there being a considerable difference with regard to age and maturity between the specimens at my disposal.

(Remark when correcting the proof of the description given above.) This species is, without doubt, nearly related to *Sc. sociabile* Annandale[1] from Bali Straits, depth 160 fathoms = 310 m. The characteristic figure Annandale gives of the group of specimens of his new species is perhaps not quite so useful for recognizing an individual specimen. As there also occur differences between his description of the valves, of the appendages, mouth-parts etc. and mine, I think it better therefore to keep my species separate; future investigators will, no doubt, easily find out whether the two species are identical or not.

20. *Scalpellum imbricatum* n. sp. Pl. VIII, fig. 15 and 15*a*.

Valves 14. Surface of valves covered by a slightly villous chitinous membrane. Carina very large, nearly reaching to the apex of the tergum, simply bowed, roof furrowed longitudinally. Rostrum narrow, indistinct. Infra-median latus narrow, with the umbo at the apex. Carinal latus with the umbo at a short distance from the base, slightly projecting beyond the line of the carina.

This species is represented by one specimen only.

The capitulum is rather narrow, the carinal margin regularly bowed, the curvature nearly reaching to the apex of the scutum. The surface is covered by a thin slightly villous membrane which makes it difficult at first sight to distinguish the margins of the valves. There are slight interspaces between the different valves, specially distinct in the corner where the upper latus, the carinal and infra-median latera meet.

The scutum is quadrilateral; the length not quite twice the breadth. The apex is pointed and slightly overlaps the tergum.

The tergum is triangular, its occludent margin nearly quite straight. The apex is bluntly pointed and hardly produced.

The carina is very large, nearly reaching to the tip of the tergum. It has a very pronounced curvature. It has well developed sides and a roof that increases in breadth though not very much from the apex downwards. The roof is distinctly furrowed longitudinally.

The upper latus is pentagonal; its umbo is at the apex which fits into the angle formed by the scutal margin of the tergum and the lateral margin of the scutum.

The rostrum (Pl. VIII, fig. 15*a*) is narrow, slightly increasing in breadth downwards, fitting exactly between the rostral margins of the rostral latera, more or less concealed by membrane.

[1] Annandale, N., Malaysian Barnacles in the Indian Museum. Memoirs of the Asiatic Society of Bengal. I, 5, 1905, p. 77, pl. VIII, fig. 2.

The rostral latus is quadrilateral, with the lateral margin considerably longer than the rostral margin.

The infra-median latus is narrow, pointed at the apex where the umbo is.

The carinal latus has the umbo near the base, slightly projecting beyond the line of the carina. Its carinal margin is distinctly hollowed out.

The peduncle is nearly cylindrical; its length is nearly $^{2}/_{3}^{rds}$ of the length of the capitulum. Its surface is covered with small rounded scales, partly covering one another, each scale being rounded and slightly swollen at the free extremity.

Size. Length of the whole animal 12,5 mm., of the capitulum 8,6 mm.

A single specimen of this species was taken by the "Siboga" at:

Stat. 251. December 8, 1899. Lat. 5° 28'.4 S., Long. 132° 0'.2 E. Depth 204 m. Bottom: hard coral sand.

Observation. The size and the form of the carina, combined with the shape of the valves of the lower whorl, of the carinal latus especially, will make it easy to distinguish this species from those nearly allied (e. g. *Sc. elongatum* Hoek), should it again turn up. It belongs without doubt to the same group of species which include *Sc. pellicatum* mihi and *Sc. sociabile* Annandale.

21. *Scalpellum crinitum* n. sp. Pl. VIII, fig. 1 and 1*a*.

Valves fourteen, covered by hairy membrane and separated from one another by broad chitinous interspaces. Carina simply bowed with the umbo at the apex, roof laterally convex. Rostrum flat conical. Infra-median latus triangular. Carinal latus with the umbo slightly beneath the middle of the carinal margin.

The capitulum is elongated, twice as long as broad, rather thick. The limits of the valves are very indistinct, in consequence of the whole capitulum being covered by a hairy membrane, to which moreover algae or other organisms are attached. Broad chitinous interspaces occur, especially between the carina and the other valves and round the upper latus.

The scutum is quadrangular with the occludent margin nearly straight and the umbo at the slightly produced apex. The valve is rather narrow at the base and grows slightly broader towards the upper extremity. Ridges of growth distinct on the under part of the valve.

The tergum is triangular. Its occludent margin is convex, its apex rounded and not produced in the specimen figured, rather sharp, though hardly produced in the other specimens.

The carina is simply bowed and has the umbo at the apex. The roof is laterally convex and slopes insensibly into the sides. The hairs which are nowhere wanting on the chitinous membrane that covers the capitulum, are longest along the free margin of the carina from which they stand off at right angles.

The upper latus is elongated and narrow, especially in the basal part. This at least holds good for the calcified part of the valve. The scutal margin is hollowed out, its carinal margin is convex.

The rostrum has about the same height as the rostral extremity of the rostral latus.

It is broader near the base, very narrow in the upper part. It is not covered by the lateral parts of the rostral latera.

The rostral latus is of an irregular shape, its basal margin being short and going over imperceptibly into the lateral margin which is convex. The scutal margin is slightly hollowed out, the angle it describes with the lateral margin truncated.

The infra-median latus is triangular with the rostral margin slightly hollowed out and the carinal margin convex. The umbo is at the apex which is distinctly bent forward.

The carinal latus has the umbo a little beneath the middle of the carinal margin. The part of that margin above the umbo is strongly hollowed out, that beneath the umbo distinctly convex. The basal margin is short, the lateral margin feebly hollowed out. The upper margin forms a sharp angle with the upper part of the carinal margin. That part of the latter where the umbo is situated can hardly be said to project beyond the line of the carina.

General remark concerning the form of the valves. The form of the valves as described above only appears after a good deal of the feltlike membrane with the calcareous algae and the muddy particles attached to them has been removed.

The peduncle is cylindrical. The scales on the surface are not very numerous, broad and rather prominent. They are placed on five not very regular rows, about five scales forming such a row.

Size. Length of the whole animal 11,25 mm., of the capitulum 8 mm.

The specimens of this species were found attached to cylindrical black sticks of four or five centimeters in length, the nature of which I do not know.

The study of the structure of the female animal contained within the capitulum has given the following results.

Body narrow, elongated, legs relatively stout.

Mouth with the labrum slightly bullate, edge with a long row of small, pointed teeth. Palpi triangular, pointed, with a few short hairs on the inner side and a tuft of longer ones at the extremity.

Mandibles short, with three teeth, each slightly swollen at the extremity. The inferior angle is delicately pectinated and the surface over a great part is covered with very thin hairs, forming groups of three or more.

Maxillae with a distinct notch beneath the group of upper spines, which consists of one very stout spine, one rather stout and one or two much more delicate. Beneath the notch, in which only some very short hairs are planted, the edge bears about seven spines of unequal size and a few very delicate and much shorter spines. Surface covered with hairs, arranged in groups.

Second maxillae bulky; outer surface rounded covered by numerous long hairs, forming a tuft at the upper extremity. The opening giving entrance to the body cavity is at the end of a broad and flat tubular process, cut off abruptly at the extremity.

Cirri. First pair planted close to the mouth, separated from the second by a distinct interspace. Branches of the first pair of unequal length, the shorter is slightly broader and has seven, the longer nine segments. Nearly the whole surface of both rami is covered with numerous and rather long hairs. Cirri of the following pairs relatively short and stout; the rami of

the last pair have about 15 segments, the lower being very long and representing two or three segments. Two or three pairs of spines on the front of each segment and a third or fourth pair much more delicate.

Caudal appendages minute, one-jointed, cylindrical, with the extremity rounded. One long and two or three much shorter hairs planted at the extremity.

The animal as here described is a female with no trace of a penis.

Males, two; one lodged in a pouch situated on the inner side of each scutum near the occludent margin, the capitular pole slightly projecting out of the opening of the pouch. Shape oval, longest diameter 0,8 mm., shortest 0,4 mm. Structure very simple as in many other deep-sea species. Surface naked, not covered with hairs or short spines. No trace of valves. Prehensile antennae attached at a little distance from the peduncular pole. Muscle-fibres of the sac very distinct, opening of the sac hardly visible.

H. M. S. "Siboga" collected this species at:

Stat. 45. March 6, 1899. Lat. 7° 24′ S., Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud. Five specimens.

Observation. This species might also be considered as belonging to the group with imperfectly calcified valves. It has some resemblance to *Sc. insigne* mihi from the Atlantic; it can be distinguished from that species at first sight, however, 1° by the shape and condition of the tergum, which is ∨-shaped in *Sc. insigne*, 2° by the presence of a rostrum, which is wanting in *Sc. insigne* and 3° by the form of the carina.

22. *Scalpellum humile* n. sp. Pl. VIII, Fig. 2 and 2*a*.

Valves fourteen, not covered by membrane. Scutum very large, of an irregular triangular shape. Carina simply bowed with the umbo at the apex and with a flat roof bordered by ridges. Rostrum extremely small. Infra-median latus with the umbo near the base, with the under part very narrow and the upper part rhombiform. Carinal latus with the umbo below the middle of the carinal margin, projecting beyond the line of the carina.

This deep-sea species is represented by a large and a smaller specimen.

The capitulum is flat and rather broad, the length being slightly less than twice the breadth, where it is broadest. The carinal margin is more strongly convex than the occludent margin. Valves separated by narrow interspaces, that between the carina and the other valves being broader. The surface of most of the valves is delicately furrowed; ridges of growth not very distinct.

The scutum is large; its occludent margin is straight in the under and distinctly convex in the upper part. The tergal margin is convex and slightly hollowed out near the apex which is produced into a very small triangular process overlapping the tergum. The lateral and basal margins slope into one another forming an arch; at the upper extremity a short part of the lateral margin forms a triangle with the extremity of the tergal margin.

The tergum is triangular and rather elongated in consequence of the slightly convex occludent margin not being very long. A small excrescence at the carinal margin above the point where the apex of the carina touches the tergum.

The carina is simply and not very strongly bowed; umbo at the apex. Roof flat not increasing much in width from the upper to the lower extremity, bordered by distinct ridges. Sides of about the same width over the whole length of the carina.

The upper latus has six margins, the scutal margin being divided into two parts, one rather short and straight the other larger and hollowed out. The umbo is at the angle where these two lateral margins meet. The tergal margin is straight, also the short carinal margin. The lateral margin is divided into two parts: a larger which is hollowed out and separates the valve from the carinal latus and a much shorter part between it and the infra-median latus.

The rostrum (fig. 2*a*) is an extremely small valve situated in the corner where the two scuta and the two rostral latera meet.

The rostral latus is irregularly quadrangular; the rostral and lateral margins are both convex, the second is longer than the first.

The infra-median latus has the umbo near the base. The middle part is narrow with the foot slightly broader and the upper part distinctly expanded.

The carinal latus is large. The umbo is at the foot of the carina, where the carinal margin forms a distinct protuberance beyond the edge of the carina. The larger part of the carinal margin is above the umbo and is distinctly hollowed out, the shorter is beneath the umbo and convex. It slopes into the short basal margin. The upper and lateral margins are both slightly convex.

The peduncle is very short and is covered by small and numerous calcareous scales, placed in eight fairly regular longitudinal rows. Between the scales the chitin of the peduncle may everywhere be seen.

Size. The total length of the larger specimen is 10,8 mm., that of its capitulum 9 mm. The smaller one's total length is 7 mm., that of its capitulum not quite 6 mm.

The larger specimen was found attached to a small stick or stem, the nature of which is unknown to me. It was taken at:

Stat. 211. September 25, 1899. Lat. 5°40′.7 S., Long. 120°45′.5 E. Depth 1158 m. Bottom: coarse grey mud.

Observation. But for the shape of the carina this species would have great resemblance to *Sc. distinctum* Hoek. The shape of the upper latus and of the carinal latus, however, is also different; *Sc. distinctum* has, moreover, no rostrum etc. From *Sc. candidum* n. sp. to which it is similar in other regards it can easily be distinguished by the shape of its carinal latus.

23. *Scalpellum arcuatum* n. sp. Pl. VIII, fig. 3 and 3*a*.

Valves fourteen. Carina simply and feebly bowed, with a flat roof bordered by ridges. Upper latus large with a short carinal and long, irregularly bowed scutal margin. Rostrum very small, triangular. Infra-median latus narrow, with the umbo at the apex. Carinal latus with the umbo not far from the base.

This true deep-sea form is represented by one specimen only.

The capitulum is flat with the carinal side slightly and the occludent side strongly arched. It is covered by a thin membrane, which bears short hairs along the carina, forming tufts at the base of that valve and in a less degree at the apex. The carina is separated from the other valves by a distinct chitinous interspace. The valves of the lower whorl are less than medium-sized.

The scutum is quadrilateral and more than twice as long as broad. It has an arched occludent margin; its tergal margin is short; its lateral margin slightly hollowed out in the upper part and strongly convex in the lower. The apex is pointed, but not produced. Growth ridges indicated, but not distinct.

The tergum is large, triangular, with the occludent margin straight. It meets the carinal margin in a very slightly produced little point. The carinal margin is straight in the upper, feebly convex in the under part. Ridges of growth very indistinct.

The carina is simply and not strongly bowed. The roof is flat, increasing in width from the apex downwards, bordered by ridges. The lateral parts rather narrow and having about the same width over the whole length.

The upper latus is large and has a somewhat irregular shape. Its umbo is at the apex which penetrates into the corner between the scutum and the tergum. It has a long scutal margin, slightly convex in the upper and strongly hollowed out in the under part. The carinal margin is short; the lines of growth are rather indistinct.

The rostrum (fig. 3*a*) is very small and triangular; it is placed in the corner between the tips of the rostral latera and the scuta.

The rostral latus quadrilateral, rather small, as is also the case with the other valves of the lower whorl.

The infra-median latus very narrow, with the umbo at the apex, very slightly increasing in width downwards.

The carinal latus has the umbo near the base. It can hardly be said to project beyond the line of the carina. The upper part is triangular and fits into the angle between the carina and carinal latus.

The peduncle is short, broader in the upper part. The scales are broad and narrow; they are irregularly distributed over the surface.

Size. The total length of the animal is 9 mm., that of the capitulum 7,5 mm.

The only specimen is attached to a small stick or rod, the nature of which I cannot make out. It was taken by H. M. S. "Siboga" at:

Stat. 295. January 24, 1900. Lat. 10° 35'.6 S., Long. 124° 11'.7 E. Depth 2050 m. Bottom: fine grey mud.

Observation. This deep-sea form comes nearest to the species I describe on p. 105 as *Sc. gracile*. I consider the two forms as different not so much because a rostrum is present in the one and wanting in the other species, but especially because the valves of the lower whorl are much more developed in *Sc. gracile* than is the case in the present species. The carinal margin of the carinal latus is moreover slightly more hollowed out in *Sc. arcuatum* than in *Sc. gracile*.

24. *Scalpellum poculum* n. sp. Pl. VIII, fig. 4 and 4*a*.

Valves 14 not covered by membrane. Carina simply bowed with a flat roof, bordered by distinct ridges. Upper latus pentagonal with the umbo at the apex; apex produced. Rostrum narrow, slightly broader at the upper extremity. Infra-median latus irregularly wine-glass shaped, with the umbo near the base. Carinal latus with the umbo not far from the base. Peduncle very short.

This species is represented by one specimen only.

The capitulum is flat, broadest about the middle of the scutum, slightly narrower towards the base, distinctly pointed towards the upper extremity. The carina is not strongly bowed, so that the whole capitulum looks as if slightly recurved. No membrane covers the valves.

The scutum has the ordinary shape; its occludent margin is strongly arched. It is about twice as long as broad. The apex is slightly produced and overlaps the tergum.

The tergum is rather large; the occludent margin is nearly straight, the scutal margin also straight, the carinal margin slightly convex beneath and slightly concave above the middle. The apex of the carina presses very slightly into the carinal margin of the tergum. Apex hardly produced. Growth lines visible, but not very distinct.

The carina has a distinct roof and well-developed sides. The roof grows broader from the apex to the base, the sides are broadest in the upper part. The umbo is at the apex. The roof is flat, bordered by distinct ridges.

The upper latus is pentagonal, with the scutal and tergal margins by far the longest. The umbo is at the apex which is distinctly produced. The growth ridges are visible on this valve more distinctly than on any of the others.

The rostrum (fig. 4*a*) is very narrow, slightly broader towards the upper extremity. It does not reach quite so far downwards as the basal margin of the rostral latus.

The rostral latus is quadrilateral. Its lateral margin is convex, its scutal margin slightly hollowed out. The umbo is at the angle of the rostral and scutal margins.

The infra-median latus has the shape of a wine-glass, more or less inclined to one side. Though the name I propose for the species was chosen from this characteristic, I do not consider the shape of this valve of so essential importance: I afterwards discovered that the right infra-median latus shows by no means the same shape so distinctly as the left.

The carinal latus is rather large with a long carinal margin and the umbo seated near the base. The lateral margin which is sinuous in the valve of the left side, describes a nearly regular curvature in the same valve of the right side of the capitulum.

The peduncle is very short, the scales are relatively large and not numerous; they cover the whole surface and are much pressed together.

Size. The total length of the specimen is 6,6 mm., that of the capitulum 5,3 mm.

The "Siboga" collected the single specimen at:

Stat. 300. January 30, 1900. Lat. 10° 48′.6 S., Long. 123° 23′.1 E. Depth 918 m. Bottom: fine grey mud.

Observation. This curious deep-sea species may be easily distinguished from the

other species of the same group by the shape of the carina, by the rostrum and by the size and form of the infra-median latus.

25. *Scalpellum discolor* n. sp. Pl. VIII, fig. 5.

Valves thirteen covered by membrane. Tergum triangular, with the occludent margin nearly straight and the carinal margin convex. Carina simply and not strongly bowed with the umbo at the apex; roof flat bordered by ridges; sides hardly broader in the upper than in the under part. Infra-median latus small, with the umbo at the apex and the lateral margins nearly parallel. Umbo of the carinal latus at a short distance from the base, not projecting beyond the line of the carina. Scales of the peduncle covering one another like the tiles of a roof.

This species is represented by one specimen only.

The capitulum is rather flat, broad, less than twice as long as broad. The carinal and rostral sides are nearly equally convex; the occludent margin of the scutum forms an angle with the nearly straight occludent margin of the tergum. Valves covered with a yellowish membrane which is here and there distinctly pigmented with darker brown. The ridges of growth are very distinct in most of the valves, the furrowing of the surface less distinct in most.

The scutum is elongate with the umbo at the apex. The apex is produced, but can hardly be said to project over the tergum. The occludent margin is feebly convex, the tergal and basal margins are of about the same length, the lateral margin is strongly convex with a small excavation near the upper extremity for the reception of the apex of the upper latus.

The tergum is triangular with the occludent margin nearly straight. Its carinal margin is convex and shows a trace of an angular excrescence above the point where the apex of the carina touches the carinal margin. About $^1/_3{}^{rd}$ of the carinal margin extends beyond the apex of the carina.

The carina is simply and not strongly bowed, with the apex at the umbo. The flat roof increases in breadth from the apex to the base and is bordered by distinct ridges. The sides of the carina do not increase in breadth from the lower to the upper half of the valve.

The upper latus has the umbo at a little distance from the apex, which forms a pointed excrescence entering into the angle between the scutum and the tergum. The scutal margin is strongly hollowed out. The shape of the valve is pentagonal.

The rostral latus is quadrilateral with the scutal and basal margins of nearly equal length.

The infra-median latus is also quadrilateral. It has the umbo at the apex in the corner where the four valves: the scutum and three latera meet. Its rostral-lateral margin is hollowed out, its carinal-lateral margin nearly straight.

The carinal latus has the umbo near the base at the carinal margin, which can hardly be said to project beyond the line of the carina.

The peduncle is short, truncated, conical. The scales cover one another like the tiles of a roof. They are not very numerous and arranged in 8 or 9 longitudinal rows.

Size. The total length of the specimen is 18,6 mm., that of its capitulum 14,5 mm.

The single specimen was collected at:

Stat. 221. November 4, 1899. Lat. 6° 24′ S., Long. 124° 39′ E. Depth 2798 m. Bottom: solid, bluish grey mud with Foraminiferae.

Observation. This species is no doubt nearly related to *Sc. trapezoideum* n. sp. and to *Sc. truncatum* Hoek. Under *Sc. trapezoideum* I give the reasons why I think it better to consider them as three different species. *Scalpellum truncatum* Hoek was collected by the "Challenger" (a single specimen also) at a depth of 2520 m., 12° 8′ S.L. and 145° 10′ E.L. and therefore may also be considered as an inhabitant of the Indian Archipelago.

26. *Scalpellum trapezoideum* n. sp. Pl. VIII, fig. 6.

Valves thirteen not covered by membrane. Tergum with the occludent margin straight and the carinal margin distinctly divided into two parts. Carina simply and not strongly bowed with the apex at the umbo; roof flat bordered by ridges; sides considerably broader in the upper than in the lower part. Infra-median latus narrow with the umbo at the apex, hour-glass shaped. Umbo of the carinal latus near the base, slightly projecting beyond the line of the carina. Scales of the peduncle narrow, at some distance from one another, projecting beyond the surface.

This species is represented by one specimen only.

The capitulum is broad, much less than twice as long as broad, flat in the upper, thicker in the lower half; the straight occludent margin of the tergum forms an angle with the occludent margin of the scutum. Valves not covered by membrane, surface showing the growth-ridges, but not so distinct as the furrows.

The scutum is elongate, with the umbo at the apex. The apex is very slightly produced, but cannot be said to project over the tergum. The form of the scutum is nearly the same as in *Sc. discolor*, the lateral margin being however not so strongly convex.

The tergum has the shape of a trapezium: the perfectly straight occludent margin forms an angle of about 80° with the upper part of the carinal margin, which runs nearly parallel to the scutal margin. The length of this part of the carinal margin is about $^1/_4{}^{\text{th}}$ the whole length of that margin; where it meets the much longer and slightly convex lower part of the same margin a small excrescence is formed, just above the place where the apex of the carina touches the tergum.

The carina is simply and not strongly bowed, with the umbo at the apex. The flat roof increases considerably in width from the apex to the base and is bordered by distinct ridges. The sides of the carina are considerably broader at the upper extremity than in the lower part.

The upper latus has the umbo near the apex, the scutal margin hollowed out and the carinal margin very short. It is pentagonal as it has a short basal margin separating it from the infra-median latus, and a rather long basal margin along the carinal latus.

The rostral latus is quadrilateral with the upper and basal margins of about the same length.

The infra-median latus is narrow; its shape is that of an irregular hour-glass, the

upper part being smaller than the lower part. The umbo is at the apex in the corner where the scutum, the upper latus, the rostral and infra-median latus meet.

The carinal latus is rather large. The umbo is at a short distance from the base, that part of the carinal margin slightly projecting beyond the line of the carina.

The peduncle is short, truncated, conical, with very prominent scales placed at some distance from one another in five not quite regular longitudinal rows.

Size. The total length of the specimen is 24 mm., that of its capitulum 17,7 mm.

It was found attached to a piece of black stone, the nature of which is unknown to me.

The only specimen was collected at:

Stat. 214. October 27, 1899. Lat. 6° 30′ S., Long. 121° 55′ E. Depth 2796 m. Bottom: grey and green mud.

Observation. This species is nearly related to *Sc. discolor* n. sp. and to *Sc. truncatum* Hoek. It differs from the last-named species by the absence of the rostrum, by the shape of the infra-median latus and also by the less truncated form of the tergum. From *Sc. discolor* it differs by the nakedness of the valves, by the form of the tergum and by the more distinct furrows on the surface of the valves. The shape of the infra-median latus and that of the scales of the peduncle are also different. As there is only one specimen of *Sc. trapezoideum* and one of *Sc. discolor* at my disposal, future investigations will have to determine whether these differences have really the importance of specific characteristics.

27. *Scalpellum proclive* n. sp. Pl. VIII, fig. 7*a*.

Valves thirteen. Surface nearly smooth. Margins of valves distinct. Carina with a flat roof, bordered by ridges. Valves of the lower whorl rather large. Infra-median latus with the umbo beneath the middle and the upper part growing broader towards the tip. Carinal latus with the umbo at a short distance from the base, the two parts of the carinal margin meeting at an obtuse angle.

The capitulum is elongate, more than twice as long as broad. Carinal side about as strongly bowed as the rostral side. Apex of the tergum produced and feebly recurved. The surface of the capitulum is nearly smooth and the margins of the valves can be easily made out in consequence.

The scutum is quadrilateral, with the apex produced. The occludent margin is considerably longer than the lateral margin, the tergal margin is longer than the basal margin.

The tergum is triangular. Its occludent margin is nearly straight; it meets the carinal margin at a sharp angle, so that the apex appears to be produced. The carinal margin is straight in the upper and distinctly convex in the lower part.

The carina is long, reaching to $^1/_4{}^{\text{th}}$ the length of the carinal margin of the tergum from the apex of that valve. It is rather strongly bowed with the umbo at the extremity. It has a flat roof, bordered by ridges, and distinct sides, which have about the same width all over their length.

The upper latus is pentagonal. The umbo is at the apex, near the angle where the

tergal and scutal margins meet. The scutal margin is feebly hollowed out. The short basal margin separates this valve from the infra-median latus, the other, longer basal margin separates the upper latus from the carinal latus.

The rostral latus is quadrilateral; its rostral and lateral margins are longer than its upper and basal margins.

The infra-median latus has the umbo below the centre. The lower part of the valve is narrow and small, the upper part grows broader towards the upper extremity.

The carinal latus is rather large. The umbo is near the base at the tip of a part of the carinal margin which projects slightly beyond the line of the carina. The remaining and larger part of the carinal margin is very slightly hollowed out for the reception of the carina.

The peduncle is cylindrical. Its length is about $^1/_8$rd that of the capitulum, its width is about $^1/_2$ its length. It is covered with distinct, rather large scales of regular form, arranged in six longitudinal rows. The number of scales in each longitudinal row is about 18.

Size. The total length of the specimen representing this species is 9,1 mm., that of the capitulum 6,8 mm.

It was found along with *Sc. deforme* attached to the same small stem of a Tubularian at:

Stat. 87. June 19, 1899. Lat. 0° 32′ S., Long. 119° 39′.8 E. Depth 655 m. Bottom: fine grey mud.

28. *Scalpellum deforme* n. sp. Pl. VIII, fig. 7*b*.

Valves thirteen. Surface covered with a hairy membrane, the margins of the valves not distinct in consequence. Carina simply but very feebly bowed, laterally convex, roof and sides not separated by ridges. Valves of the lower whorl rather small. Infra-median latus narrow with the umbo at the apex. Carinal latus with the umbo at a short distance from the base.

The capitulum is clumsy in shape, nearly as broad at the base as in the middle, less than twice as long as broad. Carinal side feebly, rostral side strongly bowed. Apex of the tergum hardly produced but distinctly recurved. The surface of the capitulum is covered by membrane, which is feltlike and distinctly hairy along the carina.

The scutum is quadrilateral, large. The apex is somewhat produced and distinctly recurved. Tergal margin about as long as the basal margin.

The tergum is triangular and also large. The occludent margin is bowed and meets the carinal margin at a not very sharp angle; this apex is distinctly recurved. The carinal margin is straight in the upper and convex in the lower part.

The carina is feebly bowed, not very long. It reaches to about $^1/^3$rd the length of the carinal margin of the tergum from the apex of that valve. The umbo is at the apex. It has no flat roof, being laterally convex and the roof sloping insensibly into the sides.

The upper latus is large, quadrilateral, with a very short carinal and a very long scutal margin. This latter margin is strongly convex in the lower and slightly convex in the upper part. Where the two parts meet a depressed angle is formed. The tergal margin is somewhat longer than the basal margin. The apex is slightly produced; the umbo is at the apex.

The rostral latus is rather broad, but not high. The upper and basal margins are

considerably longer than the rostral and lateral margins. Where the upper and rostral margins meet the umbo is seated, that part of the valve being distinctly produced.

The infra-median latus is small, very narrow, elongated with the umbo at the apex.

The carinal latus is trapeziform, with a short lateral and a much longer carinal margin. The umbo is near the base; it hardly projects beyond the carina; the upper part of the carinal margin is only very indistinctly hollowed out for the reception of the carina.

The peduncle is thick, short and laterally flat. Its length is only a little greater than its width and is less than $^1/_3$rd the length of the capitulum. It is covered with rather flat but broad scales, the margins of which are not very distinct.

Size. The total length of the specimen representing this species is 10,5 mm., that of the capitulum 8 mm.

The specimen was found along with *Sc. proclive* attached to the same small stem of a Tubularian at:

Stat. 87. June 19, 1899. Lat. 0° 32′ S., Long. 119° 39′.8 E. Depth 655 m. Bottom: fine, grey mud.

Observation. This species belongs to the same group of species or subdivision of the genus as *Sc. proclive*, *Sc. gracile*, *Sc. Novae-Zelandiae* and a few more. It will be for future investigators to settle whether or not we are entitled to consider them as so many different species.

29. *Scalpellum gracile* n. sp. Pl. VIII, fig. 8.

Valves thirteen, covered by a thin membrane. Scutum rather narrow, its tergal margin less than half as long as the tergal margin of the upper latus. Carina with the umbo at the apex, with a flat roof bordered by not very prominent ridges and with the sides narrow. Upper latus large, almost triangular owing to the carinal margin being very short. Infra-median latus elongate, very narrow. Carinal latus with the carinal margin nearly straight and the umbo at a short distance from the base.

This species is represented by three specimens.

The capitulum is flat, oval, twice as long as broad, with the occludent margin as strongly (or slightly more) arched as the carinal margin. The surface of the valves is covered by a thin membrane, to which small particles of mud etc. adhere. Hence the surface has a yellowish colour; the valves are delicately furrowed, but the furrowing is visible only after the surface has been cleaned with a small brush or pencil. Valves of the lower whorl rather large.

The scutum is elongate, more than twice as long as broad. The occludent margin is distinctly bowed, the lateral margin hollowed out in the upper and convex in the lower part. The tergal margin is short; it meets with the occludent margin at the apex, where a small triangular projection is formed which slightly overlaps the tergum.

The tergum is large, triangular. The occludent margin is convex, the scutal margin nearly straight. The carinal margin is convex, with the exception of the upper part which is straight and which meets with the occludent margin at a sharp angle: the apex is slightly recurved.

The carina is simply and not strongly bowed. Its umbo is at the apex. The roof is

narrow and is bordered by ridges which are not prominent. The sides are also narrow, only slightly increasing in width from below upwards.

The upper latus is large with the apex produced, entering into the narrow angle between the lateral margin of the scutum and the scutal margin of the tergum. The shape of the valve is triangular, one of the angles is, however, truncated by the short carinal margin, and another, the basal, by the very short basal margin between this valve and the rostral latus. The umbo is at a little distance from the apex, close to the scutal margin.

The rostral latus is quadrilateral and rather high. The angle formed by the scutal and lateral margins is truncated and the valve at that angle is in contact with the upper latus.

The infra-median latus is narrow and elongate with the umbo at the superior extremity. The latter touches the upper latus.

The carinal latus is quadrilateral. The carinal margin is the longest; it is nearly straight, only very feebly hollowed out in the upper part for the reception of the lower extremity of the carina. The umbo is at a short distance from the base. The lateral margin is straight, the upper margin slightly convex.

The peduncle is nearly cylindrical, compressed laterally. The scales are thin and broad and rather prominent. They are placed in five longitudinal rows, each row having about fifteen.

Size. The whole length of the largest specimen was 13,6 mm., that of its capitulum 10 mm. The size of the other specimens was but slightly different.

The study of the animal contained within the capitulum has yielded the following results:

Mouth. The labrum has the front part somewhat bullate, forming a rounded slightly overhanging projection; crest with very minute teeth; palpi short and broad, rounded at the extremity, where about half a dozen hairs are planted.

Mandibles with three teeth and the inferior angle pectinated; the distance between the tips of the first and second tooth equals that between the tips of the second and third and of the third to the inferior angle.

Maxillae with the edge perfectly straight; about the middle the edge has an interspace without spines, four spines (two large, one smaller and one very small) being inserted above the interspace and about six rather short spines, only one of which is longer than the others, below.

Outer maxillae rounded, bristles in two separate groups. Openings giving entrance to the body cavity at the end of long, flat processus, cut off transversely at the extremity.

Cirri. First pair attached near the base of the mouth and at a little distance from the second pair; rami very unequal, the shortest having 7 to 8 very broad segments, soldered tightly together, so that the limits can only be distinguished with difficulty; the longer ramus has 9 much narrower segments, the first of which is very long. The shape of the shorter ramus as a whole is leaf-like, that of the longer cylindrical. Both rami are covered with numerous and long spine-like hairs.

Second pair elongate, also with unequal rami: the shorter has 12, the longer ramus 16 segments. In both rami the first segment is very long, the 3 or 4 following are nearly quadrilateral, the fifth growing longer and slightly narrower, until the last are very elongate

and narrow. The segments bear numerous spines all over the surface and also 3 to 5 pairs of longer ones along the anterior margin.

The cirri of the 3rd to 6th pair have extremely elongate and narrow rami. Those of the 6th pair have rami of about 23 segments, which are all long and narrow but of which the middle ones (from the 8th—18th) are by far the longest and bear the greatest number (5 pairs) of spines along the anterior margin.

Caudal appendages elongate, narrow, reaching to the end of the pedicel of the sixth cirrus, composed of five cylindrical segments, each having a few long hairs at the extremity. At the end of the fifth segment half a dozen hairs are planted, three of which are very long and measure about the length of the three last segments of the caudal appendage.

No trace of a penis.

The specimen I investigated was furnished with a cluster of eggs attached to the inner side of the sac or mantle; the animal was not in a good state of preservation, and I can only say that the eggs seemed to form but one cluster. There were in all 53 eggs, the size of which was about 0,5 × 0,33 mm., their shape being oval. The colour of the (preserved) eggs was dark orange. The yolk of these eggs was composed of rather large spherical globules.

I observed two small males, one on each side at the ordinary place. They were in a bad state of preservation. Their length was 0,8 mm., they were more than twice as long as broad. The little animals were, however, distinctly shrivelled, therefore narrower, most probably, than they would be in the living condition. Round the opening giving entrance to the sac four small calcareous plates were observed, two small and two slightly larger, all of them of oval shape. The rest of the surface is covered with very minute spine-like hairs which are placed in transverse rows. The prehensile antennae are attached at about one third the length of the animal from the peduncular pole.

This species was collected by H. M. S. "Siboga" at:

Stat. 211. Septbr. 25, 1899. Lat. 5°40′.7 S., Long. 120°45′.5 E. Depth 1158 m. Bottom: coarse grey mud.

Observation. This species is nearly related to *Sc. obesum*; the form of the capitulum as a whole and the greater height of the valves of the lower whorl, together with the different shape of the peduncle and its scales make it necessary to consider them as different species. The present species also shows affinity to *Sc. incertum* and to *Sc. arcuatum*, which, however, are both species with a rostrum.

30. *Scalpellum elegans* n. sp. Pl. VIII, fig. 9.

Valves (14) 13, covered here and there by membrane, beautifully striated. Carina simply bowed, with the umbo at the apex and a flat roof bordered by ridges. Upper latus trapeziform. Valves of the lower whorl well-developed, with exception of the narrow, triangular infra-median latus. Rostrum hardly visible, represented by an extremely narrow streak. Umbo of the carinal latus a little below the middle of the nearly straight carinal margin.

This beautiful species is represented by one specimen only.

The capitulum is elongate, twice as long as broad, rather flat. Its occludent margin is nearly straight, its carinal margin strongly arched. The apex of the tergum is pointed. The surface of the valves is here and there, especially at the occludent side, covered with membrane, bearing short hairs. There is a distinct chitinous interspace between the carina and the other valves. The valves of the lower whorl are strongly developed; the upper margin of the carinal latus is the prolongation of the same margin of the rostral latus.

The scutum is quadrilateral, about twice as long as broad. Its lateral and occludent margins are parallel and nearly straight. Where the occludent and tergal margins meet the slightly pointed and recurved apex projects over the tergum.

The tergum is triangular, with the scutal margin straight, the occludent margin also straight, the carinal margin slightly convex in the lower part, nearly straight in the upper. The apex pointed, but hardly produced.

The carina is strongly bowed, with the umbo at the apex. It has a flat roof bordered by ridges and increasing in width, but not very considerably, from the apex downwards. The sides of the carina are flat; their width in the middle is slightly less than near the upper and under extremity.

The upper latus is trapeziform; its tergal and basal margins are of equal length, its scutal margin is twice as long as its carinal margin. The umbo is at the apex which very slightly projects over the scutum.

The rostrum is hardly visible; as the rostral margins of the rostral latera do not touch one another and as an extremely narrow streak of probably calcareous matter is seen longitudinally in the middle of this interspace, there is reason to consider this as representing the rostrum.

The rostral latus is quadrilateral and rather high. Its rostral and lateral margins are convex, its upper margin hollowed out, its basal margin short and straight.

The infra-median latus is triangular, narrow, with the umbo at the apex. It is considerably less in height than the other latera, so that the lateral margins of the rostral and carinal latus meet above the apex of the infra-median latus.

The carinal latus is elongate, trapeziform. Its carinal margin is the longest. It is slightly hollowed out in the upper half where the carina rests against it, and straight below the umbo. Its lateral and upper margins are of equal length and straight; its basal margin is the shortest.

All the valves, the carina excepted, are beautifully and delicately striated.

The peduncle is cylindrical and short. It is covered by well-developed scales which overlap each other like the tiles of a roof.

Size. The length of the whole animal is 20,5 mm., that of the capitulum 15,5 mm.

The animal is attached to a long tube in the form of a spiral, the dwelling-place probably of a tubicolous annelid.

The specimen was collected by H. M. S. "Siboga" at:

Stat. 208. September 22, 1899. Lat. 5° 39′ S., Long. 122° 12′ E. Depth 1886 m. Bottom: solid green mud.

Observation. This species has some resemblance to *Sc. vitreum* Hoek collected by the "Challenger" not far from Yeddo, in Japanese waters. The form of the whole capitulum, that of the carina and the rostral latus show, however, its distinctness.

31. *Scalpellum sculptum* n. sp. Pl. VIII, fig. 10.

Valves fourteen, not covered by membrane, beautifully grooved. Carina with a flat roof bordered by distinct ridges, short, hardly surpassing in length the carinal margin of the tergum. Rostrum small triangular. Other valves of the lower whorl high. Infra-median latus narrow, rectangular, with the umbo at the apex. Carinal latus pentagonal, with the umbo above the middle of the carinal margin.

This pretty species is represented by one specimen only.

Its capitulum is elongate and nearly equally convex on the carinal and rostral sides. It is not flat, the carina having a broad roof and the scuta being moreover rather convex. The valves are not covered by membrane but show a very fine sculpture of parallel grooves all over their surfaces. There are no membranous interspaces between the valves. The valves of the lower whorl are strongly developed.

The scutum is quadrilateral; its occludent margin is strongly convex, its basal margin nearly straight and much shorter than the tergal margin. The lateral margin is also straight with a slight deviation near the upper extremity.

The tergum is large, triangular. Its occludent and scutal margins are straight, its carinal margin is feebly hollowed out in the upper and slightly convex in the lower part. The apex is slightly produced and recurved.

The carina is short, simply and not strongly bowed, with the umbo at the apex. The roof is flat, increases greatly in width from above downwards and is bordered by distinct ridges. The sides in the superior part are rather broad and at angles greater than 90° with the roof. They are distinctly furrowed in this part.

The upper latus is trapeziform and has the four margins nearly straight. The scutal margin is the longest; where it meets with the tergal margin the apex is truncated. Here the umbo forms a pointed, hardly distinguishable projection.

The rostrum (fig. 10*a*) is very small and of a triangular shape. It is not covered laterally by the rostral latera.

The rostral latus is quadrangular with the rostral and lateral margins of nearly equal length. Its upper margin is feebly hollowed out, its basal margin is short and straight.

The infra-median latus is narrow and elongate. It has the umbo at the upper extremity and as it has about the same breadth all over its length the shape may be given as rectangular.

The carinal latus is pentagonal, owing to its carinal margin being divided into two parts of unequal length which form together an obtuse angle. The umbo is seated at this angle, at the tip of the lower and longer part of the carinal margin. The upper part of this margin is very slightly notched to receive the basal extremity of the ridge which borders the roof of the carina. The upper and lateral margins of the carinal latus are of about the same length.

The umbo of the carinal latus does not project beyond the line of the carina. The right and left carinal latera meet over the whole length of the lower part of the carinal margin.

The peduncle is very short and completely covered by rather large scales, forming six longitudinal rows. About six scales are present in each row.

Size. The total length of the specimen representing this species is 7,6 mm., the capitulum alone measuring 6,2 mm.

The specimen was taken by H. M. S. "Siboga" at:

Stat. 221. November 4, 1899. Lat. 6° 24′ S., Long. 124° 39′ E. Depth 2798 m. Bottom: solid bluish grey mud with Foraminifera.

Observation. This species shows some resemblance to *Sc. vitreum* dredged by the "Challenger" near Yeddo from a depth of 1875 fathoms (about 3375 m.). The general habitus, the sculpture of the surface of the valves, the structure of the carina and the large size of the valves of the lower whorl are nearly equal in both species. But in *Sc. vitreum* no rostrum was observed; its infra-median latus is triangular and much shorter than the other valves of the lower whorl; finally, the carinal latus has the umbo at one fourth of the total length of the carinal margin from the inferior extremity, not above the middle of that margin as is the case in *Sc. sculptum*. Under similar circumstances (bottom mud, depth ± 3000 m.), from perhaps similar ancestors, two forms have developed, the distinctness of which can not be doubted though their resemblance is equally striking.

32. *Scalpellum formosum* n. sp. Pl. VIII, fig. 11 and 11*a*.

Valves fourteen, not or but very indistinctly covered by membrane, beautifully striated. Tergum with the apex produced and pointed. Carina simply bowed, with the umbo at the apex, with a flat roof bordered by ridges and with the sides well-developed. Upper latus trapeziform. Rostrum elongate, very narrow. Valves of the lower whorl well-developed. Infra-median latus triangular. Carinal latus pentagonal, the carinal margin consisting of two parts, forming an angle where they meet.

This fine deep-sea species is represented by two specimens collected at two different Stations.

The capitulum is elongate, rather flat, with the occludent margin slightly more convex than the carinal margin and the apex produced and pointed. The length of the capitulum is about twice its breadth.

The scutum is large, quadrangular, with the occludent margin strongly convex and the lateral margin straight. The tergal margin is a little longer than the basal margin and meets the occludent margin at the slightly recurved apex which overlaps the tergum.

The tergum is triangular; its occludent margin is straight, or even slightly hollowed out (as in the specimen figured). The scutal margin is straight and so is the carinal margin with a little convexity in the lower part only. About a third of the carinal margin projects beyond the apex of the carina.

The carina is simply and not very strongly bowed, with the umbo at the apex and with a roof and well-developed sides. The roof is rather broad at the base and is bordered by distinct ridges. The sides increase but slightly in width from the base upwards.

The upper latus is trapeziform. The length of the carinal margin is less than half the length of the scutal margin. The tergal margin has about the same length as the basal margin.

The rostrum (fig. 11*a*) is elongate, narrow. It is almost entirely covered (especially so in the specimen from Station 227) by the lateral parts of the rostral latera.

The rostral latus is irregularly quadrangular. Its rostral margin is shorter than its lateral margin, its basal margin much shorter than its scutal margin.

The infra-median latus is triangular and has the umbo at the apex. The latter does not quite reach to the slightly truncated scutal-basal angle of the upper latus. The height of this small valve is slightly greater in the specimen from Station 241 than in that from Station 227.

The carinal latus has a pentagonal shape, with a short basal margin, a convex lateral margin, and a straight upper margin. The umbo is below the middle of the carinal margin, the two parts forming an angle together. The upper part is slightly hollowed out at its base where the under extremity of the carina rests against it.

All the valves are beautifully striated. The striae radiate, as a rule, from the umbo over the surface of the valve. The ridges of growth are very indistinct; traces of them may be seen on the scutum and the upper latus.

The peduncle is short, cylindrical. The surface is covered by scales placed on a few longitudinal rows. One of these rows on each side has more prominent scales and the number of scales composing it is six or seven. The peduncle of the specimen from Stat. 241 was found attached to a small piece of black stone (like lava); the other specimen is attached to a small, greyish, calcareous stone.

Size. The total length of the specimen from Station 241 is 14,3 mm., the capitulum alone measuring 11,3 mm.

The two specimens representing this species were collected by H. M. S. "Siboga" at:

Stat. 227. November 13, 1899. Lat. 4° 50′.5 S., Long. 127° 59′ E. Depth 2081 m. Bottom: grey mud with an upper layer of brown mud, both mixed with sand.

Stat. 241. December 1, 1899. Lat. 4° 24′.3 S., Long. 129° 49′.3 E. Depth 1570 m. Bottom: dark sand with small stones.

Observation. The two specimens differ from one another in that the rostrum is much narrower in the one than in the other, as also that the shape of the tergum and the size of the infra-median latus are not alike. But I consider the points of agreement of greater importance than these differences. This new species comes nearest to *Scalpellum vitreum* collected by the "Challenger" off Yeddo.

33. *Scalpellum hexagonum* n. sp. Pl. VIII, fig. 12.

Valves thirteen, not covered by membrane. Scutum nearly triangular. Carina simply, not strongly bowed, umbo at the apex. Roof without ridges, laterally slightly convex. Upper latus large, elongate hexagonal. Rostral latus small; infra-median latus narrow and very small; carinal latus rather large, with the umbo in the middle of the carinal margin.

This new deep-sea species is represented by three specimens.

The capitulum is elongate, about twice as long as broad, flat. It is not covered by membrane and the lines of growth of the different valves are not very distinct. Though the carina is not strongly bowed, the carinal side of the capitulum is more strongly convex than the rostral or occludent side. There is no rostrum, hence the total number of the valves is thirteen. The scutum and the upper latus are of considerable size and very peculiar shape.

The scutum is large; in consequence of the shortness of the basal margin the shape of the scutum is almost triangular. The occludent margin is straight, only feebly convex in the upper part. The tergal margin is rather long; it forms a small slightly recurved apex with the occludent margin. The lateral margin has a depressed angle slightly above the middle of its length.

The tergum is medium-sized. Its occludent margin is convex; its carinal margin slightly convex in the lower and hollowed out in the upper part; its scutal margin is feebly hollowed out about the middle. The apex of the tergum is distinctly recurved, but blunt, not pointed.

The carina is rather long, reaching to $^{3}/_{4}^{\text{ths}}$ of the length of the carinal margin of the tergum. It is not strongly bowed and its sides are only well-developed in the upper part. The roof increases in width from the apex downwards; it is not bordered by ridges, but laterally convex.

The upper latus is very large and of an irregular, elongate hexagonal shape. The umbo is almost in the middle of the scutal margin, where a slight convexity fits into the depressed angle of the lateral margin of the scutum. The length of the different margins can be seen in the figure.

The rostral latus is very small, its shape is distinctly pentagonal. Its rostral margin is considerably longer than the lateral margin, which separates it from the infra-median latus.

The infra-median latus has the umbo at the apex. It is a narrow and relatively short valve.

The carinal latus is irregularly pentagonal. Its carinal margin is divided into two nearly equal parts at an angle with one another. The upper part is hollowed out for the reception of the basal part of the carina. The upper margin has a slight excrescence about its middle point. The lateral margin is the shortest of all.

The peduncle is short, cylindrical, slightly broader at the upper extremity. Its surface bears rather broad and narrow scales placed in not quite regular rows: one at the carinal and one at the rostral side alternating with one placed in the middle of the left and one in the middle of the right side.

Size. The total length of the specimen figured is 7,5 mm., that of the capitulum 6,6 mm.

The study of the structure of the animal contained within the capitulum has yielded the following results:

Mouth slightly bullate, with the part directed forward rounded. Labrum with a row of small but distinct teeth, those in the middle of the row slightly larger and distinctly pointed. Palpi slender, with a few short hairs along the outer margin and a couple slightly longer near and at the tip.

Mandibles with three equally distant teeth and the distance between the third teeth and the pectinated inferior angle very short.

Maxillae with a distinct notch about the middle of the edge; with four spines, two of

which are longer than the others, above and four beneath the notch. Of the latter, one is much longer and stronger than the three others. Apodeme moderately long.

Outer maxillae rounded, hairs in three distinct groups; processus with the opening giving entrance to the body cavity rather long and rounded at the end.

Cirri. First pair with very unequal rami: the anterior indistinctly divided into six segments, broad, growing narrower towards the extremity, flat; the posterior ramus longer, composed of eight segments, somewhat cylindrical. In both rami the first segment is much longer than the following; the last is again rather short. Surface of both rami covered with long bristles. The first pair of cirri is attached close to the mouth and at some distance from the second pair.

The second pair has nearly equal rami of respectively 12 and 13 segments. The first segment in both rami is the longest; next come three or four segments which are only slightly longer than broad; then five or six segments which grow gradually longer and narrower, while the remainder are shorter than the foregoing, but narrower. The longest segments have four pairs of spines along the anterior margin: the first pair short, the second pair slightly longer, the third rather long, the fourth pair by far the longest and stoutest.

The last pair of cirri has 20 segments in both rami, 13 segments, however, in one of the rami of the right cirrus. Segments gradually increasing in length, with 3 and 4 pairs of spines on the anterior margin. The spines of the last segments are extremely long and distinctly curved.

Caudal appendages rather long and narrow, composed of five segments. The end of the fourth segment reaches to the end of the pedicel of the sixth cirrus. A couple of very long and delicate hairs are planted at the end of the third and fourth segments, half a dozen at the tip of the 5th segment.

No penis. Animal unisexual. The specimen I investigated was furnished with a cluster of eggs, altogether 20 in number, soldered together and attached with two threadlike "ovigerous frena" to the inner surface of the mantle or sac. The size of the eggs was: 0,43 × 0,3 mm. Their shape was oval.

I found one little male attached to the interior of the left scutum in one of the specimens and I think I also saw one on the right side of the same individual. The shape of the one I loosened from the female was broad, oval, its dimensions being 0,55 × 0,4 mm. I observed the prehensile antennae attached to the sac at a short distance from the peduncular pole. No trace of valves. Extremely short and delicate hairs could be seen only at that part of the surface, which corresponds to the capitular pole. [The little animal was not in a very good state of preservation — other details of its structure could not well be made out.]

Of this interesting species three specimens were found attached to a much ramified deep-sea organism of unknown nature. A specimen of Verruca spec. was attached to the same plant. It was dredged at:

Stat. 221. November 4, 1899. Lat. 6° 24′ S., Long. 124° 39′ E. Depth 2798 m. Bottom: solid bluish grey mud with Foraminifera.

Observation. This is a very characteristic species. The shape of its scutum is much like that of *Sc. distinctum* Hoek and *Sc. humile* n. sp.; in other regards (more elongate form

of its upper latus, smallness and shape of its infra-median latus, form of the carinal latus etc.) the present species is, however, so different, that it can be distinguished from the above-named species at first sight.

34. *Scalpellum praeceps* n. sp. Pl. VIII, fig. 13.

Valves fourteen, covered by a velvety membrane; margins of valves not everywhere to be distinguished. Carina with the umbo at the apex, simply and strongly bowed, with a flat roof bordered by ridges. A chitinous interspace between the carina and the other valves. Rostrum covered by membrane, narrow, elongate. Infra-median latus small, triangular. Carinal latus with the umbo not far from the base, at the tip of an obtuse angle formed by the longer upper and shorter under half of the carinal margin.

This species is represented by one specimen only.

The capitulum is covered by a chitinous membrane which has a villous or velvety appearance. The little hairs are especially conspicuous along the free margin of the carina. As shown in the figure the margins of the valves in consequence of the presence of this covering can not everywhere be made out distinctly. The carina is separated from the other valves by a chitinous interspace which is broadest between the tergum and the carina. The capitulum is rather steep (*praeceps*) and elongate, being twice as long or high as broad. The occludent margin is slightly, the carinal margin strongly convex. The apex of the tergum and of the whole capitulum is in consequence pointed and very slightly recurved.

The scutum has the ordinary shape; the occludent margin is convex in its upper part. The apex forms a very distinct recurved projection over the scutal margin of the tergum. The scutum is about twice as long as broad.

The tergum is triangular. Its occludent margin is convex; its carinal margin nearly straight. Where these two margins meet the pointed and feebly recurved apex is formed.

The carina is simply and rather strongly bowed with the umbo at the apex. Its roof increases in width from the apex downwards, longitudinally hollowed out, being bordered by rather prominent ridges. The sides of the carina have about the same width over the whole length.

The upper latus is trapeziform: the carinal margin runs parallel with the scutal one. The umbo is at the apex, which is very slightly produced.

The rostrum is very narrow, covered by membrane, overlapped at each side by the lateral margins of the rostral latera.

The rostral latus is quadrilateral, with the scutal or upper margin uplifted and forming the continuation of the upper margin of the carinal latus. The length of the upper margin is less than twice the length of the basal margin of the same valve.

The infra-median latus is very small, triangular, with the umbo at the apex.

The carinal latus is rather large and irregularly quadrilateral in shape. The upper part of the carinal margin is slightly hollowed out, the under part slopes into the basal margin and is convex. Where the two parts of the carinal margin meet the umbo is formed, which very slightly projects beyond the line of the carina. The lateral and upper margins meet at a very blunt angle. The basal margin can hardly be distinguished as a special margin.

The surface of the valves seems to be delicately striated; this striation, however, is made nearly quite invisible by the chitinous membrane. It is slightly more distinct on the surface of the carinal latus.

The peduncle is cylindrical, rather stout and short: about $^1/_4{}^{th}$ the length of the capitulum. Its surface is invested with large scales, placed on five longitudinal rows, each row composed of about 6 scales. The peduncle is also covered by membrane.

Size. The length of the specimen is 14,5 mm., that of its capitulum 11,7 mm.

It was taken by H. M. S. "Siboga" at:

Stat. 159. August 16, 1899. Lat. 0° 59'.1 S., Long. 129° 48'.8 E. Depth 411 m. Bottom: coarse sand.

Observation. This species in the shape of its capitulum and valves has a great resemblance to *Sc. striatum* Gruvel, a species taken by the "Talisman", at a depth of 2995 m. in the Atlantic not far from the Azores. But it differs from that species by its velvety membrane and also by the form of the rostrum which is narrow and hardly visible in *Sc. praeceps* and which (according to Gruvel) in *Sc. striatum* is: "très net, triangulaire, allongé".

35. *Scalpellum incertum* n. sp. Pl. VIII, fig. 14 and 14*a*.

Valves fourteen, not covered by membrane, growth-ridges indistinct. Carina simply bowed, with the umbo at the apex and with a flat roof bordered by ridges. Upper latus trapeziform with the scutal margin nearly straight. Rostrum very small, hardly visible. Infra-median latus triangular, very narrow, with the umbo at the apex. Umbo of the carinal latus very close to the base of the carinal margin.

Of this species the "Siboga" collected two specimens.

The capitulum is flat, nearly twice as long as broad, with the apex pointed and not recurved. The scutum is rather large though not very broad; the rostral latus is much narrower at the base than at its scutal margin. The carina is not strongly bowed, the lower extremity reaches to near the base of the carinal latus. A chitinous interspace separates the upper part of the carina from the tergum.

The scutum is quadrangular, about twice as long as broad; the basal and tergal margins are of the same length, the occludent margin is strongly convex, the lateral margin very feebly convex, nearly straight.

The tergum has a straight occludent margin, a straight scutal margin and an almost straight carinal margin: the latter is slightly convex only in the lower part.

The carina is simply and not strongly bowed. The smaller and no doubt younger specimen of the two has the carina less bowed than the larger (the one figured). The umbo is at the apex; the roof is not very broad but bordered by distinct ridges; the sides are rather narrow and of nearly equal breadth over the whole length of the valve.

The upper latus is nearly trapeziform, not quite so as the angle formed by the scutal and basal margins is truncated. The carinal margin is very short the scutal margin is nearly straight, but slightly hollowed out. The umbo is at a little distance from the point where the scutal and tergal margins meet.

The rostrum is hardly visible, being covered on both sides by the margins of the rostral latera. The rostral margins of the two rostral latera do not touch, so that a narrow strip of the small rostrum remains uncovered.

The rostral latus is quadrangular with the angle formed by the lateral and scutal margins truncated. Its basal margin is much shorter than the scutal margin.

The infra-median latus is triangular, very narrow, with the umbo at the apex. The apex does not quite reach to the truncated angle of the upper latus.

The carinal latus is quadrangular, with the carinal margin only very slightly hollowed out, with the upper margin straight and the basal margin slightly shorter than the lateral margin. The umbo is very close to the lower extremity of the carinal margin and does not project beyond the line of the carina.

The peduncle is short, cylindrical but laterally compressed. The scales on the surface are narrow, horizontally extended and at some distance from one another. They are arranged in seven longitudinal rows: three on each side and one on the carinal side of the peduncle. There are about 8 scales in each longitudinal row in the largest specimen.

Size. The total length of the largest specimen was 11 mm., that of its capitulum 8 mm.

Both specimens were found attached to a brownish-coloured thread or fibre the nature of which is unknown to me.

They were collected by H. M. S. "Siboga" at:

Stat. 161. August 17, 1899. Lat. 1° 10'.5 S., Long. 130° 9' E. Depth 798 m. Bottom: muddy sand. 2 specimens.

Observation. This species has a great resemblance to various other species, for example, to *Sc. gracile* n. sp. It differs from it by the shape of the upper latus and of the carinal latus, as also by the presence of a rudimentary rostrum of which no trace could be found in *Sc. gracile*. But for the shape of the carinal latus it would be considered as belonging to the same group of species as *Sc. formosum*, *Sc. truncatum* (which have a rostrum) and as *Sc. tenue*, *Sc. proclive* and *Sc. deforme* (species without a rostrum).

36. *Scalpellum fissum* n. sp. Pl. IX, fig. 1 and 2.

Valves thirteen. Tergum with the apex recurved. Carina simply and not strongly bowed with the umbo at the apex, with narrow sides and with a laterally convex roof, bordered by ridges. Upper latus with a longitudinal fissure. Infra-median latus wine-glass shaped. Carinal latus with the umbo at the base.

The curious species is represented by four specimens, two large and two smaller ones.

The capitulum is rather flat and covered by a delicate membrane to which Radiolarians etc. adhere. Margins of the valves distinct. The occludent margin convex, in the smaller specimens even more strongly bowed than the carinal margin. Apex of the tergum recurved. Valves of the lower whorl well-developed.

The scutum is quadrilateral with the occludent margin convex. The tergal margin is also convex in the larger specimens; in the smaller it is nearly straight. The lateral margin is

convex in the under part, where it forms a continuous curvature with the basal margin. It is hollowed out in the lower part where the apex of the upper latus borders upon it.

The tergum is triangular. The occludent margin is convex, the carinal margin is slightly hollowed out above the middle at the place where the apex of the carina touches it. The surface of this valve appears to be larger in the smaller (shown in fig. 2) than in the larger specimens as represented in fig. 1. Apex distinctly recurved.

The carina has a well-developed roof and narrow sides. The roof is not quite flat, but laterally convex with narrow, rather flat borders. This valve is simply bowed, not very strongly in the full-grown specimens, but much less so in the younger specimens, one of which is represented in fig. 2. The carina of the latter is almost straight, making the convexity of the occludent side of the capitulum much more prominent.

The upper latus is the most characteristic of the valves: it is almost divided into two nearly equal halves by a split or fissure reaching from the basal margin to near the umbo of the valve: the same fissure has about the same relative length on both sides of the four specimens at my disposal. The apex of the valve is truncated, the umbo is at the extremity of a triangular portion which rises slightly above the surface of the valve. The carinal margin of the upper latus is short, the basal margin hollowed out, being divided into two parts, the longer of the two having a very conspicuous curvature.

The rostral latus is quadrilateral with the lateral margin convex. The scutal margin is slightly longer than the basal margin.

The infra-median latus is wine-glass shaped and has the umbo very near to the base.

The carinal latus is irregularly quadrangular. Its carinal margin is nearly straight, its basal margin also straight. The lateral margin is convex and its upper margin is divided into two parts, which meet together at an angle entering into the hollowed out basal margin of the upper latus. Near its base the carinal margin has a little excrescence of nearly quadrangular form meeting beneath the base of the carina with the same excrescence of the same valve on the other side.

The peduncle is cylindrical. In all four specimens it is distinctly curved, more strongly, however, in the full-grown specimens than in the smaller. Its base of attachment is prolonged at one end towards the occludent side of the capitulum and is covered by a large number of scales arranged in fairly regular rows. The number of these rows is greater in the larger than in the smaller specimens; while they are at some distance from one another in the smaller specimens, they nearly touch in the full-grown animal. In consequence of the peduncle being bent it is not easy to count the number of the longitudinal rows; in the full-grown specimen their number, however, is not less than 14 to 15.

Size. The largest specimen had a capitulum of 9,2 mm. Its peduncle, if it could be stretched quite straight, would measure about 7 mm. One of the smaller specimens had a total length of 9,1 mm., its capitulum measuring 6,5 mm.

The specimens are attached to small stems or sticks of different nature.

The study of the structure of the animal within the capitulum has yielded the following results:

Mouth slightly bullate; crest of labrum with a row of very minute bead-like teeth.

Palpi short, broad at the base, conical; a tuft of bristles at the apex, a few short hairs on the interior margin.

Mandibles with three teeth and the inferior angle pectinated; tooth 1 and 2 twice as far from one another as tooth 2 and 3; distance between 3 and inferior angle still smaller. Surface of mandible covered with delicate hairs in groups of two or three on the part near the toothed edge. Short hairs along the inferior margin.

Maxillae with a distinct notch slightly above the middle of the edge. Above the notch the edge bears three strong and a smaller spine; beneath the notch the edge is straight and is furnished with seven or eight spines of nearly equal size. Surface near the edge covered with hairs; superior margin furnished with a few hairs in the neighbourhood of the first spine, inferior margin with a row of numerous hairs.

Outer maxillae have the inner surface rounded with numerous bristles, which can hardly be said to be divided into two different groups; opening communicating with the body-cavity at the end of a very long and flattened projection, cut off transversely at the extremity.

Cirri. First pair at a little distance from the second, short, with unequal rami, shorter ramus flat with eight segments which are oblong in transverse direction; segments much flattened towards the inner margin where each is furnished with a row of five or six strong spines; longer ramus with 9 segments, of a more cylindrical shape, furnished with a row of five to six spines along the outer as well as along the inner margin. Both rami thickly clothed with longer hairs.

Second cirrus shorter than the following. Anterior ramus with seventeen, posterior with eighteen segments. First segment long, segments 2—8 nearly quadrilateral, segments 9 and following ones becoming more and more elongate, last segments very long and narrow. Each segment has about four pairs of bristles along the anterior margin, a few hairs along the posterior margin and also one or two longer hairs at the extremity of each segment.

Sixth cirrus rather long with about twenty-four segments in each ramus. Basal segment long, cylindrical, segments 2—6 quadrilateral, 7 and following ones growing gradually longer and more slender. As a rule the segments are furnished with four pairs of spines along the anterior margin and a single spine (or no spine) at the posterior margin near the extremity.

Caudal appendages have six segments. They are very slender, and reach with their last segment only slightly beyond the pedicel of the 6th cirrus. Very long and delicate hairs are planted at the extremity of the second to sixth segments. The extremity of the last segment is furnished with half a dozen hairs, two of which are longer than twice the length of the segment.

No penis.

Male. I found two males on the one, three on the other side of one of the females. They are attached to the inner side of the scutum, near the occludent margin, in a duplicature of the sac or mantle, slightly in front of the adductor muscle. They have the ordinary long oval shape and show no trace of valves. Their size is about 0,84 × 0,42 mm. Their surface is clothed with very short hairs or spines, which stand alone or in groups of two or three without forming regular rows. Slightly longer hairs form a little tuft on each side of the opening giving entrance to the interior of the sac. The prehensile antennae have the ordinary shape: a longer

cylindrical segment and a shorter conical one; they are attached about the middle of the length and not at or near the extremity of the male. The musculature of the sac is strongly developed, the muscles forming parallel hoops along the inner side of the transparent sac. The male genital apparatus is well-developed, the animals being in ripe or nearly ripe condition. The testiculum is heart-shaped and communicates with an oval receptaculum seminis, quite filled up with the thread-like spermatozoa.

This species was collected by H. M. S. "Siboga" at two stations, viz.:

Stat. 137. August 3, 1899. Lat. 0° 23′.8 N., Long. 127° 29′ E. Depth 472 m. Bottom: fine dark muddy sand. One large and two smaller specimens.

Stat. 212. September 26, 1899. Lat. 5° 54′.5 S., Long. 120° 19′.2 E. Depth 462 m. Bottom: fine grey and green mud. One larger specimen.

Observation. This is without doubt a very characteristic species. The curious shape and structure of the upper latus entitles one fully to say so. The change in shape of the capitulum and of the carina and tergum especially, which appears to take place during growth is, I think, also worthy of mention. I give two figures therefore: one of the largest and one of a younger specimen.

37. *Scalpellum candidum* n. sp. Pl. IX, fig. 3 and 3*a*.

Valves fourteen, not covered by membrane. Carina simply bowed with the umbo at the apex; its roof flat, very broad, bordered by ridges. Upper latus pentagonal, apex not produced. Rostrum small, circular. Infra-median latus large with the umbo at the base. Carinal latus triangular, with the umbo at the angle formed by the carinal and basal margins.

This small species is represented by one specimen only. In many regards it resembles *Sc. poculum* (pag. 100) and I think it best merely to point out the differences between these two species.

The lateral and basal margins of the scutum and the short margin separating this valve from the infra-median latus describe together one continuous arch, which is not the case in *Sc. poculum*.

The occludent margin of the tergum is distinctly convex, its apex is recurved.

The carina has the lower part of the roof broader than in *Sc. poculum*.

The apex of the upper latus is not produced, not so distinctly produced as in the other species.

The rostrum is hardly visible. It is a very small circular plate fitting exactly between the upper rostral extremities of the rostral latera.

The rostral latus has the rostral margin considerably shorter than the lateral margin so that the basal and scutal margins are not nearly parallel (as in *Sc. poculum*) but distinctly diverging.

The infra median latus of the present species has a more compressed form.

The carinal latus is large and has an irregular triangular shape, the lateral and upper margins sloping into one another insensibly and the carinal margin forming one straight line. The umbo is seated quite at the base where the carinal and basal margins meet at a sharp angle.

The scales of the peduncle are very distinct, at some distance from one another and placed in 8 longitudinal rows. The length of the peduncle is about half the length of the capitulum.

Size. The total length of the animal is 7,8 mm., that of the capitulum 5,5 mm.

The "Siboga" took the specimen at:

Stat. 251. December 8, 1899. Lat. 5° 28′.4 N., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand.

38. *Scalpellum virgatum* n. sp. Pl. IX, fig. 4.

Valves thirteen covered with a delicate brownish membrane. Carina with the umbo at the apex and with a flat roof bordered by ridges. Lateral margin of the scutum with a deep triangular incision near the upper extremity for the reception of the apex of the upper latus. Valves of the lower whorl large. Infra-median latus wine-glass shaped with the umbo near the base. Carinal latus quadrilateral with the umbo near the base.

This curious deep-sea species is represented by a single specimen only.

The capitulum is rather flat, little more than twice as long as broad, having the carinal margin slightly more convex than the occludent margin. The apex of the tergum is pointed and a little recurved. The surface is of a browny yellowish colour; scratching it with a needle a very delicate skin or membrane loosens in little flocks from the surface. The ridges of growth are very distinct on most of the valves; parallel furrows are visible on the scutum, on the upper latus and also on the carinal latus near the base. The valves are separated from each other by narrow, but distinct chitinous interspaces; that between the tergum and the upper half of the carina being much broader than the others.

The scutum has a very characteristic shape. Its occludent margin is convex; its tergal margin hollowed out near the apex and convex towards the other extremity. The lateral and basal margins slope into one another quite insensibly; near the upper extremity the lateral margin shows a very characteristic incision in which the apex of the upper latus fits exactly.

The tergum is triangular. Its occludent margin is convex, its carinal margin slightly hollowed out in the upper, slightly convex in the lower part. The apex is not strongly, yet distinctly recurved.

The carina has a flat roof which is bordered by ridges, but does not increase in width very strongly from the apex downwards. The sides of the carina are well-developed over its whole length, they increase only slightly in width from the base to the tip of the valve.

The upper latus is pentagonal with the sides of very unequal length. The carinal and the basal margin along the infra-median latus are the shortest, the convex tergal margin which is slightly hollowed out in the middle is the longest. The lateral margin is hollowed out and a little longer than the basal margin separating this valve from the carinal latus. The umbo is at the apex which may be called beaked.

The rostral latus is quadrilateral; the upper and basal margins are of about equal length, the rostral margin is slightly convex, the lateral margin distinctly convex.

The infra-median latus has the shape of a wine-glass and is relatively large. Both

lateral margins are distinctly hollowed out. The umbo is near the base, beneath the centrum of the triangular part which represents the foot of the wine-glass.

The carinal latus is large and has an irregular quadrilateral shape. The carinal margin is nearly straight, the umbo of the valve is at the angle where the carinal and basal margins meet. The upper and lateral margins meet at a very blunt angle.

The peduncle is short and shows eight not very distinct, longitudinal rows of scales: three on both sides, one along the carinal and one along the rostral side of the peduncle. The scales are much larger and much more distinct near the upper extremity of the peduncle.

Size. The only specimen representing this species has a total length of 19 mm. the length of the capitulum being 14,8 mm. It was found attached to a bundle of brownish threads or hairs, the nature of which is unknown to me. It was taken by H. M. S. "Siboga" at:

Stat. 295. January 24, 1900. Lat. 10° 35'.6 S., Long. 124° 11'.7 E. Depth 2050 m. Bottom: fine grey mud.

Observation. This species is at once recognisable by the form of its scutum and that of its infra-median latus and carinal latus. It belongs to the same group of species as *Sc. fissum*, *Sc. candidum* and *Sc. incertum*, but may be very easily distinguished from each of these species.

Genus **Pollicipes** Leach

In the Malay Archipelago this genus is represented by one species only[1]: *P. mitella* (Lin.). Like the other species, *P. mitella* lives near the coast in shallow water, attached to rocks, stones or shells.

Darwin described six species of this genus in 1851 and since his Monograph appeared the number has increased by one species only: *P. Darwini* Hutton from New Zealand. It is the oldest known fossil genus of Lepadids and it must have been represented by very numerous species in former geological periods: Darwin enumerates 22 fossil species in his Monograph on the fossil Lepadidae of Great Britain.

The above-named species was collected by H. M. S. "Siboga" on two different occasions.

1. *Pollicipes mitella* Lin.

This is a very characteristic species and Darwin has given an excellent description of it.

Rumphius knew it already as an inhabitant of the Malay Archipelago and also Seba. It occurs as far north as Japan, as far west and south as Madagascar, as far east as Hawaii (autor. Gruvel).

Concerning the bathymetrical distribution of this species not much is known: it is generally considered to be a shallow-water species or even a littoral form. In my Report on the Cirripedia of the "Challenger" Expedition I said that it was not on record that any one of the species of *Pollicipes* occurs at a depth of even 10 fathoms, and so far as I know this still holds good.

[1] Gruvel, Monographie p. 18, says that *P. elegans* Lesson occurs at Java, but he does not name the authority who observed that species there — I hardly believe he is right.....

During the cruise of H. M. S. "Siboga" specimens of this species were collected on two occasions:

At Station 51: Madura Bay in the southern part of Molo Strait; on the shore. About 20 specimens.
At Station 50: Bay of Badjo (West coast of Flores); on the shore.

N.B. As mentioned already p. 47 specimens of *Ibla Cumingi* Darwin were found attached to several specimens of *P. mitella* at Station 51.

Genus **Lithotrya** Sowerby

Of this genus six species were known to DARWIN in 1851 and only one new species (*L. pacifica* Borradaile) has been added to this number in the 55 years since then. They are found lodged in cavities, in calcareous rocks, shells, or corals and have been observed "generally" within the tropics. All the species occur only in shallow water.

In the Malay Archipelago and in Australian waters, 4, perhaps 5, of the known species have been observed: *L. cauta* Darwin, New South Wales, Australia; *L. nicobarica* Rhdt., Timor; *L. truncata* Quoy et Gaimard, Philippines; *L. pacifica* Borradaile, Funafuti. [Perhaps *L. rhodiopus* J. E. Gray, the habitat of which was unknown to DARWIN, belongs to the same region also; the Copenhagen Museum possesses specimens labelled *L. rhodiopus* J. E. Gray, Funafuti; they are specimens purchased from the Museum Godefroy.]

H. M. S. "Siboga" met with specimens of this genus on five different occasions; four different species are represented in this collection.

1. *Lithotrya nicobarica* Rhdt.

REINHARDT (1850) has given the description of this species founded on specimens from the Nicobar Islands. DARWIN (1851) when giving the description of this species in his Monograph had REINHARDT's paper at his disposal, but he could not compare the typical specimens used by REINHARDT. The specimens which DARWIN identified with R.'s species were from Timor.

Through the courtesy of the Director, Prof. JUNGERSEN, and the Keeper of the collection of Crustacea, Dr. MEINERT, of the Copenhagen Museum, I got free access to the specimens of this species which are to be found in that Museum. They are — according to the label — from Pulo Milu, Galatea. As Galatea Bay is the name of a Bay of the Island Sambelong (Great Nicobar), and as they are the only specimens of this species in the Museum, the probability that they are the original specimens of REINHARDT seems great[1]. They correspond with DARWIN's description and figures in all essential regards.

Several forms collected during the cruise of H. M. S. "Siboga" belong doubtless to this species. They are from two different Stations: from the reefs near Lucipara and from the reefs of the Island of Kur, West of the Kei Islands. At both places, however, together

[1] These had not been put aside as type-specimens, as is now the custom with specimens which have served for the institution of "novae species", so that Dr. MEINERT could not say with absolute certainty, that they were REINHARDT's types.

with, I might say, typical specimens of *L. nicobarica*, other specimens of a form or species of *Lithotrya* were collected, which after careful study I feel inclined to consider as different from REINHARDT's *L. nicobarica*. I shall describe the other form as a new species and call it *Lithotrya conica*; as the comparison of the different specimens with one another and with DARWIN's description brought to light that more or less interesting differences occur even between the specimens which doubtless belong to the original species of REINHARDT, I think it useful to enter into some detail on that species first of all.

With regard to the valves of *L. nicobarica* the following may be pointed out:

The scutum has the tergal margin either straight or slightly sinuous, in which case the upper part is hollowed out.

The carina has a well-developed central, internal ridge which extends over the upper half of the valve. The inner growing surface is in most specimens but very indistinctly pentagonal.

The rostrum is different in size in the different specimens, the number of zones preserved varying in the 18 specimens I was able to observe from 2—7. This number was 2 in three specimens, 3 in ten, 5 in three, 6 in one and 7 in one. The number of the subjacent scales of the peduncle, which the rostrum equals in width, varied from 4 to 7: it was 4 in four specimens, 5 in five, 6 in seven and 7 in two. In one of the specimens from Pulo Milu, Galatea, which I was able to study more carefully, the number of distinct zones was 3 and the number of scales of the peduncle which the rostrum equalled was 7. [In the figure of this species DARWIN reproduced after REINHARDT a much greater number of zones is indicated.]

The latera which according to DARWIN are unusually large in this species vary greatly in the different specimens. Their general shape is as described by DARWIN: triangular, elongated transversely with the carinal angle a rectangle; but they are much broader in some, narrower in other specimens. I compared the length of this valve with that of the carina and I thus found that it can be less than half as long as that valve and also nearly as long as it: in a specimen the length of the carina in which was 13 mm. the latus measured 11 mm., and its length was 6 mm. in another specimen, the carina of which was 7 mm. long. The number of zones of growth preserved in the specimens I investigated also differed greatly: on 18 specimens this number was once 8, twice 7, three times 5, four times 4 and six times 3. In the two remaining specimens the zones of the little valves were quite covered with chalk and could in consequence not be distinguished. The latera as a rule equal in width the seven subjacent scales of the peduncle; in some of the specimens this number, however, is six or five and in one specimen four of the scales equalled the width of this valve.

With regard to the peduncle the only difference from DARWIN's description I noticed was that the shape of the upper scales was more irregular.

With regard to the body of the animal I may point out the following:

The labrum has a row of blunt teeth; its palpi have their ends rather more rounded than truncated.

The mandibles have the distance between the tips of the first and second teeth 7, taking the distance between the tip of the second tooth and the inferior angle as 9.

The maxillae sometimes have the notch beneath the large upper and two smaller

spines distinct, sometimes it is hardly visible. In no case have I observed two large upper spines. In the notch, or if it is absent at the place it occupies in other maxillae, three or four very short and delicate hairs are planted. Next follows a slightly protuberant part with 5 or 6 pairs of spines and then a second smaller notch. Then about 8 pairs of spines and finally the slightly prominent inferior angle with a brush of rather short spines.

The outer maxillae have a small but distinct notch between the upper and lower group of spines.

Of the cirri the first pair is short; the general shape of the segments of this pair is: narrow at the base and broader at the other extremity. The anterior ramus has 8 segments on the right side and 12 on the left, the posterior 12 and 13 respectively. The segments are thickly paved with bristles, which are themselves coarsely and doubly serrated.

The second cirrus has 17 and 20 segments; the 8 basal segments of the anterior ramus are highly protuberant and thickly clothed with spines; the posterior ramus has only 5 of these basal segments and 15 upper segments with the usual structure.

The third cirrus has 22 and 24 segments: six and five of these are highly protuberant and thickly clothed with spines.

The fourth cirrus has 23 segments in both rami and the front of the basal segments not protuberant, as is the case in the three preceding pairs.

The fifth cirrus has 25—26, the sixth 23—26 segments.

The caudal appendages are long, reaching as far as the extremity of the eighth segment of the anterior ramus of the sixth cirrus. The number of segments was 23.

The penis is short, thick at the base, distinctly ringed.

During the cruise of H. M. S. "Siboga" this species was observed at the following places:

Station 225c: Reef near Lucipara islands; 8—10 November 1899. 17 specimens.
Station 250: Reef near Kur island (to the W. of the Kei islands), December 6—7, 1899. 1 specimen.

2. *Lithotrya conica* n. sp. Pl. IX, fig. 10—12.

Scutum large, indistinctly beaked and slightly overlapping the tergum; tergum much smaller than the scutum, their tips coming close together; carina triangular, strongly bowed laterally, feebly bowed vertically; rostrum small, as wide as four (or less) of the subjacent scales; latus having the shape of a parallelogram, its base as wide as four of the subjacent scales.

Palpi with the tips rounded, conical; mandibles with not very numerous pectinations between the teeth; maxillae with the inferior angle hardly prominent; outer maxillae without notch between upper and lower group of spines.

The capitulum as a whole has a conical shape, its rostral and carinal margins being both nearly equally curved. The tip of the scutum reaches as far or slightly farther than that of the tergum, the tip of the carina not extending so high up.

The scutum (Pl. IX, fig. 11 *A*) is considerably larger than the tergum, its occludent margin is bowed and long, its tergal margin is hollowed out, or (in the largest specimen)

straight. It is indistinctly beaked: the tip being rounded off as a rule. It overlaps the tergum only very slightly.

The tergum (fig. 11 *B*) has an irregular triangular shape. It is divided by a ridge running from the apex to the basal-scutal angle into two parts: a larger triangular part and a smaller one of an irregular shape. The latter part is to a small extent overlapped by the scutum. Its free margin (the scutal margin) is bowed in the upper half and slightly hollowed out in the lower half.

The carina (fig. 11 *C*) has about the same size as the tergum, its shape is triangular and it is bowed in a lateral as well as in a vertical direction: the inner surface is concave in consequence. The upper free portion has a very slight central ridge. The inner growing portion is indistinctly pentagonal.

Scutum, tergum and carina have numerous and very distinctly projecting rims on which numerous and very small teeth are visible.

The rostrum is small and is composed of only two or three zones of growth. The number of subjacent scales of the peduncle, which the rostrum equals in width, is three, in one specimen four.

The latus is also small. It has the shape of a parallelogram and shows only 3 or 4 zones of growth. Along its base there are at most four scales of the peduncle.

The peduncle shows a distinctly swollen ring covered by about six horizontal rows of scales immediately beneath the capitulum. The first, second and third row have the scales of an irregular transversely elongated shape, the inferior margin being crenated. The scales of the three following rows are much smaller (Pl. IX, fig. 12). A few rows of much smaller scales of an irregularly rounded form are seen under this swollen ring and then follows the main part of the peduncle which shows no scales on the surface and is indistinctly ringed. The width of the peduncle diminishes considerably from the capitulum downwards.

The size of the largest specimen was: length 46 mm., 34 mm. being accounted by for the peduncle; greatest breadth of the capitulum at its base: 13 mm., smallest breadth: 7 mm. Most specimens are, however, considerably smaller.

The body of the animal differs from that of *L. nicobarica* in the following regards:

The labrum has about twelve small blunt teeth on its central and about 15 on each of the lateral parts. Palpi short conical, with the tips rounded.

The mandibles have less numerous pectinations between the first and the second, as also between the second and third teeth, viz.: 12 and 7 to 8 respectively.

The maxillae have a notch, two spines are inserted above it, half a dozen delicate ones in the notch and numerous pairs of spines beneath it. The inferior angle can hardly be said to be prominent.

The outer maxillae have the spines continuous over the inner and outer margin.

The cirri correspond in general with those of *L. nicobarica*, but the number of segments is not inconsiderably smaller:

The left cirrus of the first pair has 9 and 11 segments in the slightly unequal rami; the cirrus of the right side has 11 and 12 segments in the same specimen.

The second pair has 15 and 18 segments,
the third pair 17 and 20 segments,
the fourth pair 20 and 20 (21) segments,
the fifth pair 21 and 21 segments,
the sixth pair 22 and 22 segments.

The surface of the segments of the 4th—6th cirrus is smooth or nearly so; the minute comb-like scales, which make the surface hirsute in *L. nicobarica*, are wanting in *L. conica*.

The caudal appendages contain 18 segments in the specimen in which the sixth cirrus had 22 segments in. each ramus.

The penis is much like that of *L. nicobarica*.

This species was collected at the following Stations during the expedition of H.M.S. "Siboga":

Station 225e: Reef near Lucipara Islands; 8—10 November 1899. 8 specimens.
Station 250: Reef near Kur Island (to the West of the Kei Islands), December 6—7 1899. 3 specimens.

General Remark. At both places where specimens of *L. nicobarica* were collected, specimens of *L. conica* were also found. It cannot be made out, however, with the aid of the preserved material, whether the specimens were really found at exactly the same place and lived under absolutely similar circumstances, or not. The specimens of *L. conica* are smaller than most of *L. nicobarica*; some of the latter, however, are as small as most of the *L. conica*, yet show the differences in the shape of the capitulum and of the valves, which I think are very striking. There is therefore no reason for me to admit that the one form represents younger, the other older specimens of the same species. On the other hand I would by no means be surprised if future investigations show that the two forms really belong together in some way or other.

3. *Lithotrya pacifica* Borradaile. Pl. IX, figs 13, 13*a* and 14.

BORRADAILE, L. A., On some Crustaceans from the South Pacific. Part V. Proceedings of the Zool. Soc. of London. 1900, p. 798, Pl. LI, figs 3, 3*a*.

On the east coast of Lombok two specimens of a *Lithotrya* were collected which I think belong to the species described for the first time by BORRADAILE from specimens from the outer reef of Funafuti.

The specimens from Lombok differ in several more or less important points from the diagnosis given by BORRADAILE. I consider it useful therefore to give a figure of the largest of the Lombok specimens (fig. 13) and to point out the most essential differences in a short description.

The scutum is triangular, considerably shorter than the tergum, overlapping the latter valve not a little; its external surface is very distinctly ridged.

The tergum is somewhat narrow, more elongate-rhomboidal than triangular; its basal portion is overlapped on the one side by the scutum, on the other by the latus; externally the part not overlapped by scutum and latus shows a prominent longitudinal ridge with the zones of growth running transversely and nearly straight. The latus is long and stout, its length about $^3/_4$ths the length of the tergum, its extremity being nearly on the same level with that of the

scutum. It consists of about 8 divisions, separated by prominent transverse ridges, each of which is curved with the curvature away from the extremity. The base of the latus corresponds with 4 (indistinctly 5) of the underlying scales.

The carina is very long and rather narrow, curved longitudinally and strongly bowed laterally, hence very distinctly concave over its whole length. Its extremity stands off and reaches higher up than that of the tergum. The middle row of knobs described by BORRADAILE very distinct.

The rostrum composed of 4 (in the smaller specimen 3) divisions, small and narrow, its base bordered by a row of five scales (fig. 13*a*).

The peduncle is rather thick, swollen and not very long: as long as the capitulum in the smaller specimen, about twice the length of the tergum in the larger specimen. The upper scales (fig. 14) are broad and distinctly crenated; those of the second whorl are half or one third the size of those of the upper whorl and are so placed that one is exactly under the centre of an upper scale and another between two of these. The scales of the third and fourth whorls are much smaller and not placed so regularly; then follow still smaller ones, rounded calcareous beads invisible to the naked eye, which are distributed over the whole surface of the peduncle.

The colour of the capitulum and the peduncle is a dark, beautiful brown, the tip of the tergum and the rows of scales immediately underneath the capitulum being white.

Size. The length of the largest specimen, including the peduncle, is 25 mm., the length of the carina in the same specimen being 9 mm.

The two specimens were collected at Labuan Pandan, which is on the east coast of the island of Lombok.

Observations. Perhaps DARWIN's *L. cauta* comes nearest to this species — the specimen DARWIN made use of for his description was only 5 mm. in length including the peduncle, and may not have been fullgrown.

The smaller specimen of the two collected by H. M. S. "Siboga" has the tips of some of the valves (tergum and carina) broken off and the space between the slightly distended valves is filled up with dirt; a small specimen of *Ibla* (? *Cumingi* Darwin) was found attached to the inner side of one of the valves.

4. *Lithotrya truncata* (Quoy et Gaimard).

Of this curious species, which was founded for specimens from the Friendly Archipelago, and was known to DARWIN from specimens from the Philippine Archipelago, two specimens were collected during the cruise of the "Siboga" at:

Stat. 60. 27—28 April 1899. Haingsisi, Samau Island, Timor: Shore exploration.

They are small specimens: the largest of the two measures (capitulum and peduncle together) about 11 mm. A very small specimen of what I believe to be an *Alepas* (perhaps identical with the *Alepas lithotryae* I found attached to *L. nicobarica*) occupies the corner between the tergum and the carina where the rudimentary latus is to be looked for.

PLATES

PLATE I

Fig. 1. *Poecilasma carinatum* Hoek.

Fig. 1. Group of animals; magnified 3,25 diameters.

Fig. 2—4. *Poecilasma dubium* n. sp.

Fig. 2. Animal, lateral view; magnified 3,6 diameters.
Fig. 3. Carina, lateral view; magnified 11 diameters. .
Fig. 3*a*. Carina, lower part, internal view; magnified 11 diameters.
Fig. 4. Maxilla; magnified 134 diameters.

Fig. 5—8. *Poecilasma excavatum* n. sp.

Fig. 5. Animal, lateral view; magnified 4 diameters.
Fig. 6. Tergum; magnified 10 diameters.
Fig. 7. Carina, lateral view; magnified 8 diameters.
Fig. 7*a*. Carina, lower part, external view; magnified 8 diameters.
Fig. 8. Caudal appendages; magnified 36 diameters.

Fig. 9—10. *Poecilasma excavatum*, varietas.

Fig. 9. Animal, lateral view; magnified 5,3 diameters.
Fig. 10. Apex of the scutum with the division of the tergum; magnified 36 diameters.

Fig. 11—22. *Poecilasma obliquum* n. sp.

Fig. 11. Animal seen from the right side; magnified 3,6 diameters.
Fig. 12. Animal from the left side; magnified 3,6 diameters.
Fig. 13. Scutum of the left side, interval view; magnified 3,6 diameters.
Fig. 14. Tergum of the right side, external view; magnified 36 diameters.
Fig. 15*a*. Carina, lateral view; magnified 3,6 diameters.
Fig. 15*b*. Carina, internal view; magnified 3,6 diameters.
Fig. 16. Labrum, seen from above; magnified 36 diameters.
Fig. 16*a*. Teeth of the labrum; magnified 180 diameters.
Fig. 17. Mandible; magnified 52,5 diameters.
Fig. 18. Maxilla; magnified 52,5 diamaters.
Fig. 19. Outer maxilla; magnified 52,5 diameters.
Fig. 20. Left cirrus of the fifth pair; magnified 36 diameters.
Fig. 21. Right cirrus of the fifth pair; magnified 36 diameters.
Fig. 22. Caudal appendages; magnified 36 diameters.

P. P. C. Hoek del.

POECILASMA.

Fa. P. W. M. Trap, impr.

PLATE II

Fig. 1—7. *Dichelaspis Nierstraszi* n. sp.

Fig. 1. Animal, lateral view; one of the large, hairy specimens collected at Station 258, Tual Anchorage, Kei Islands; magnified 11 diameters.

Fig. 2. Animal, lateral view, made transparent; magnified 11 diameters.

Fig. 2*a*. Very young specimen; magnified 11 diameters.

Fig. 3*a* and 3*b*. Scutum and tergum of a young specimen; magnified 28 diameters.

Fig. 4*a* and 4*b*. Scutum and tergum of a full-grown specimen; magnified 28 diameters.

Fig. 5. Carina, lateral view, of a full-grown specimen; magnified 11 diameters.

Fig. 5*a*. Carina, lower part, internal view; magnified 11 diameters.

Fig. 6. Mandible; magnified 180 diameters.

Fig. 7. Maxilla; magnified 180 diameters.

Fig. 8—13. *Dichelaspis Tydemani* n. sp.

Fig. 8. Animal, lateral view, made transparent; magnified 34 diameters.

Fig. 9. Scutum; magnified 63 diameters.

Fig. 10. Tergum; magnified 63 diameters.

Fig. 11. Carina, lower part, internal view; magnified 63 diameters.

Fig. 12. Mandible; magnified 356 diameters.

Fig. 13. Maxilla; magnified 356 diameters.

Fig. 14—18. *Dichelaspis orthogonia* Darwin.

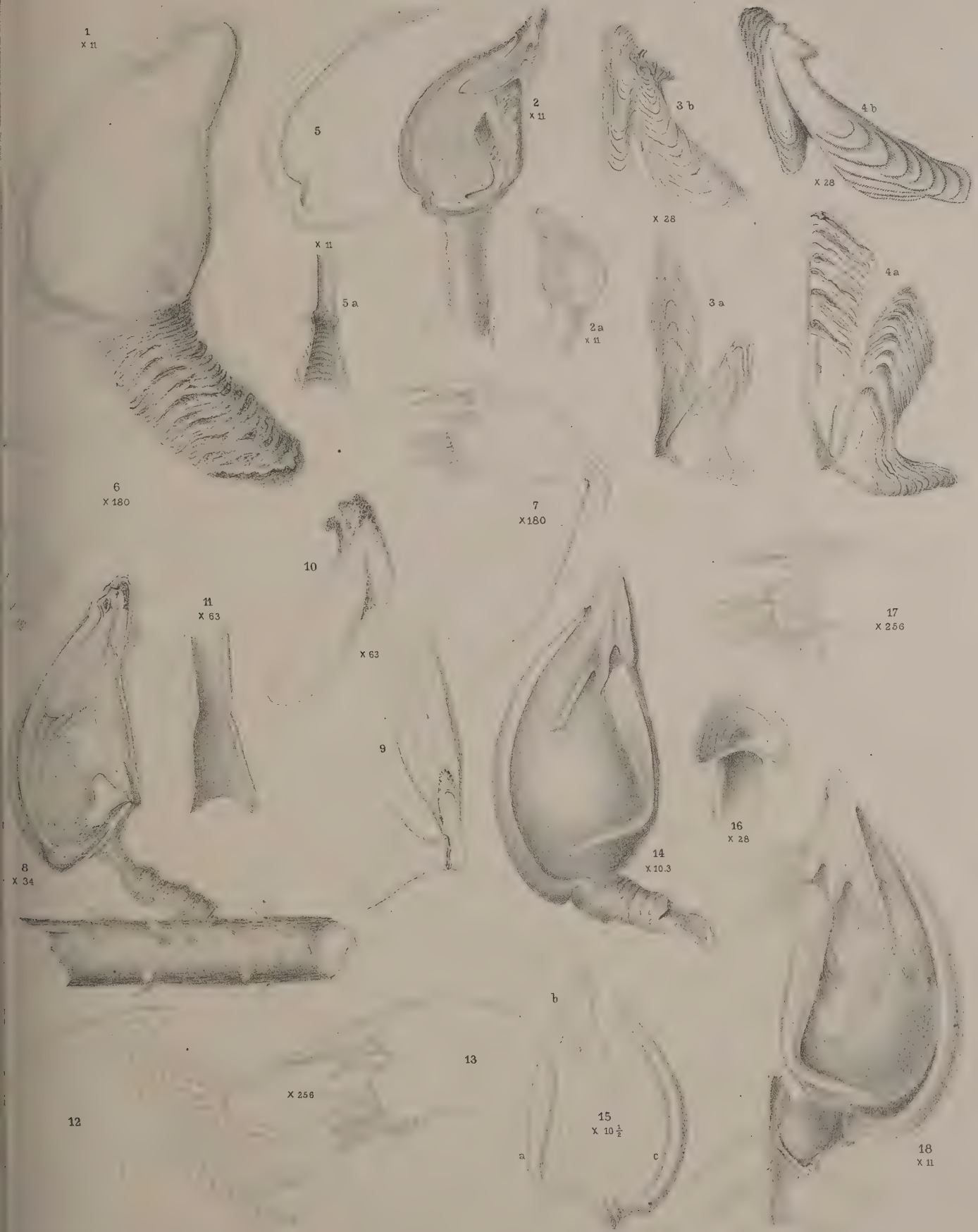
Fig. 14. Animal, lateral view; magnified 10,3 diameters.

Fig. 15. *a*. Scutum; *b*. Tergum; *c*. Carina; magnified 10,5 diameters.

Fig. 16. Termination of the carina, external view; magnified 28 diameters.

Fig. 17. Maxilla; magnified 254 diameters.

Fig. 18. A specimen of the same species from another Station; magnified 11 diameters.



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DICHELASPIS.

PLATE III

Fig. 1, 1*A*, 1*B* and 10*b*. *Dichelaspis orthogonia* Darwin.

Fig. 1. *a*. Scutum; *b*. Tergum; *c*. Carina; magnified 19 diameters.

Fig. 1*A*. Very young specimen; magnified 36 diameters.

Fig. 1*B*. Young specimen; magnified 36 diameters.

Fig. 10*b*. Carina from the interior; magnified 15 diameters.

Fig. 2—7. *Dichelaspis Weberi* n. sp.

Fig. 2. Animal, lateral view; magnified $6^3/_8$ diameters.

Fig. 3. *a*. Scutum; *b*. Tergum; *c*. Carina; magnified 10 diameters.

Fig. 4. Carina, external view of the disc; magnified 10 diameters.

Fig. 5. Mandible; magnified 134 diameters.

Fig. 6. Maxilla; magnified 134 diameters.

Fig. 7. Outer maxilla; magnified 52 diameters.

Fig. 8—13. *Dichelaspis Versluysi* n. sp.

Fig. 8. Animal, lateral view; magnified 11 diameters.

Fig. 9. *a*. Scutum; *b*. Tergum; *c*. Carina; magnified 15 diameters.

Fig. 10*a*. Carina from the interior; magnified 15 diameters.

Fig. 11. *a*. Mandible, magnified 63 diameters; *b*. inferior angle of the mandible of the right side; *c*. the same of the mandible of the left side. 11*b* and *c* magnified 160 diameters.

Fig. 12. Maxilla; magnified 180 diameters.

Fig. 13. Caudal appendage; magnified 63 diameters.

Fig. 14. *Dichelaspis Versluysi*, varietas.

Fig. 14. Animal, lateral view; magnified 11 diameters.

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DICHELASPIS.

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PLATE IV

Fig. 1—8. *Megalasma lineatum* n. sp.

Fig. 1. Animal, lateral view; magnified 5 diameters.
Fig. 2. Same, as seen from the carinal side; magnified 5 diameters.
Fig. 3. Interior of *a*, scutum, *b* tergum and *c* carina; magnified 5 diameters.
Fig. 4. Carina, dorsal view; magnified 5 diameters.
Fig. 5. Labrum; magnified 52,5 diameters.
Fig. 6. Mandible; magnified 52,5 diameters.
Fig. 7. Maxilla; magnified 52,5 diameters.
Fig. 8. Pedicels of cirri of the sixth pair with the caudal appendages (c. a.); magnified 52,5 diameters.

Fig. 9—12. *Alepas morula* n. sp.

Fig. 9. Animal, lateral view; magnified 3,4 diameters.
Fig. 10. Labrum; magnified 52,5 diameters.
Fig. 11. Mandible; magnified 52,5 diameters.
Fig. 11*a*. Inferior angle of the same; magnified 180 diameters.
Fig. 12. Maxilla; magnified 52,5 diameters.

Fig. 13—16. *Alepas intermedia* n. sp.

Fig. 13. Animal, lateral view; magnified 3,6 diameters.
Fig. 14. Labrum; magnified 52,5 diameters.
Fig. 15. Mandible; magnified 52,5 diameters.
Fig. 16. Maxilla; magnified 52,5 diameters.

Fig. 17—18. *Alepas ovalis* n. sp.

Fig. 17. Animal, lateral view; magnified 3,3 diameters.
Fig. 18. Animal, seen from the rostral side; magnified 4 diameters.

Fig. 19. *Alepas tenuis* n. sp.

Fig. 19. Animal, lateral view; magnified 3,3 diameters.

Fig. 20—22. *Ibla Sibogae* n. sp.

Fig. 20. Animal, lateral view after the right half of the capitulum and the whole body has been taken away. Two little males are seen in the mantle-cavity; magnified 3 diameters.
Fig. 21. Interior of the scutum *A* and the tergum *B*; magnified 18 diameters.
Fig. 22. Labrum with the mandible of the right side; magnified 52,5 diameters.
Fig. 22*a*. Inferior angle of the mandible; magnified 254 diameters.

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MEGALASMA — ALEPAS — IBLA.

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PLATE V

Fig. 1—8. *Ibla Sibogae* n. sp.

Fig. 1. Maxilla; magnified 180 diameters.

Fig. 2. Second maxilla; magnified 78 diameters.

Fig. 3. Male; magnified 36 diameters.

Fig. 4. Front part of the same male; magnified 78 diameters.

Fig. 5. Front part of another male, seen from the dorsal side; magnified 180 diameters.

Fig. 6. Labrum with palp and mandible *in situ*, of a male; magnified 180 diameters.

Fig. 7. Mandible of a male; magnified 440 diameters.

Fig. 8. Maxilla of a male; magnified 440 diameters.

Fig. 9—11. *Scalpellum pollicipedoides* n. sp.

Fig. 9. Animal seen from the left side; magnified 11 diameters.

Fig. 10. Another specimen; *a*, the two additional valves of the lower whorl; magnified 11 diameters.

Fig. 11. Complemental male; *a*, antennae, *c*, carina, *r*, rostrum, *sc*, scutum, *t*, tergum, *t'*, part of the tergum, corresponding with the primary valve; magnified 180 diameters.

Fig. 12. *Scalpellum aries* n. sp.

Fig. 12. Animal, lateral view; magnified 5,6 diameters.

Fig. 13. *Scalpellum rostratum* Darwin.

Fig. 13. Complemental male; magnified 52,5 diameters.

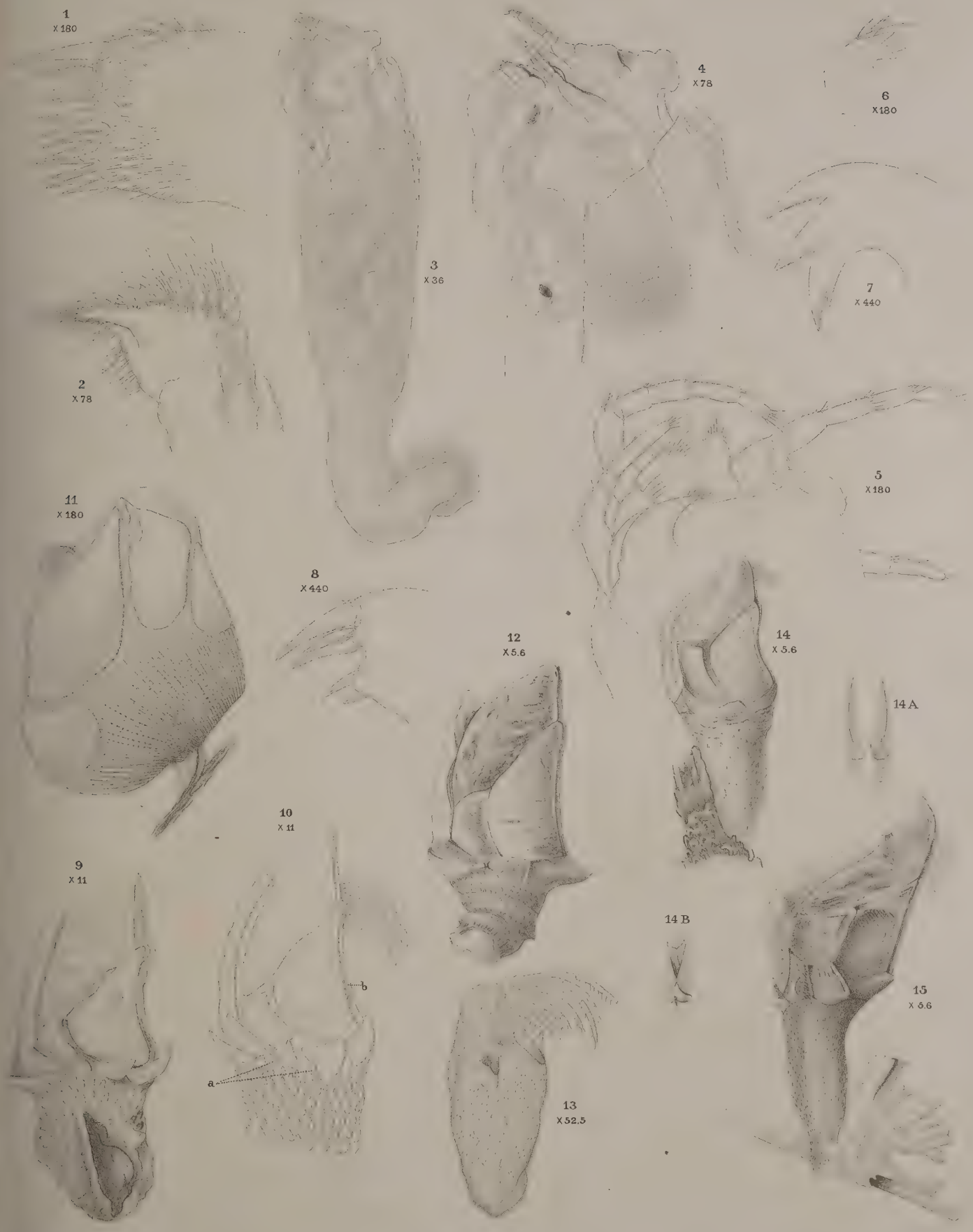
Fig. 14. *Scalpellum Peroni* (Gray).

Fig. 14. Animal, lateral view; magnified 2,8 diameters.

Fig. 14*A*, Sub-carina; 14*B*, Rostrum.

Fig. 15. *Scalpellum uncus* n. sp.

Fig. 15. Animal, lateral view; magnified 5,6 diameters.



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IBLA — SCALPELLUM.

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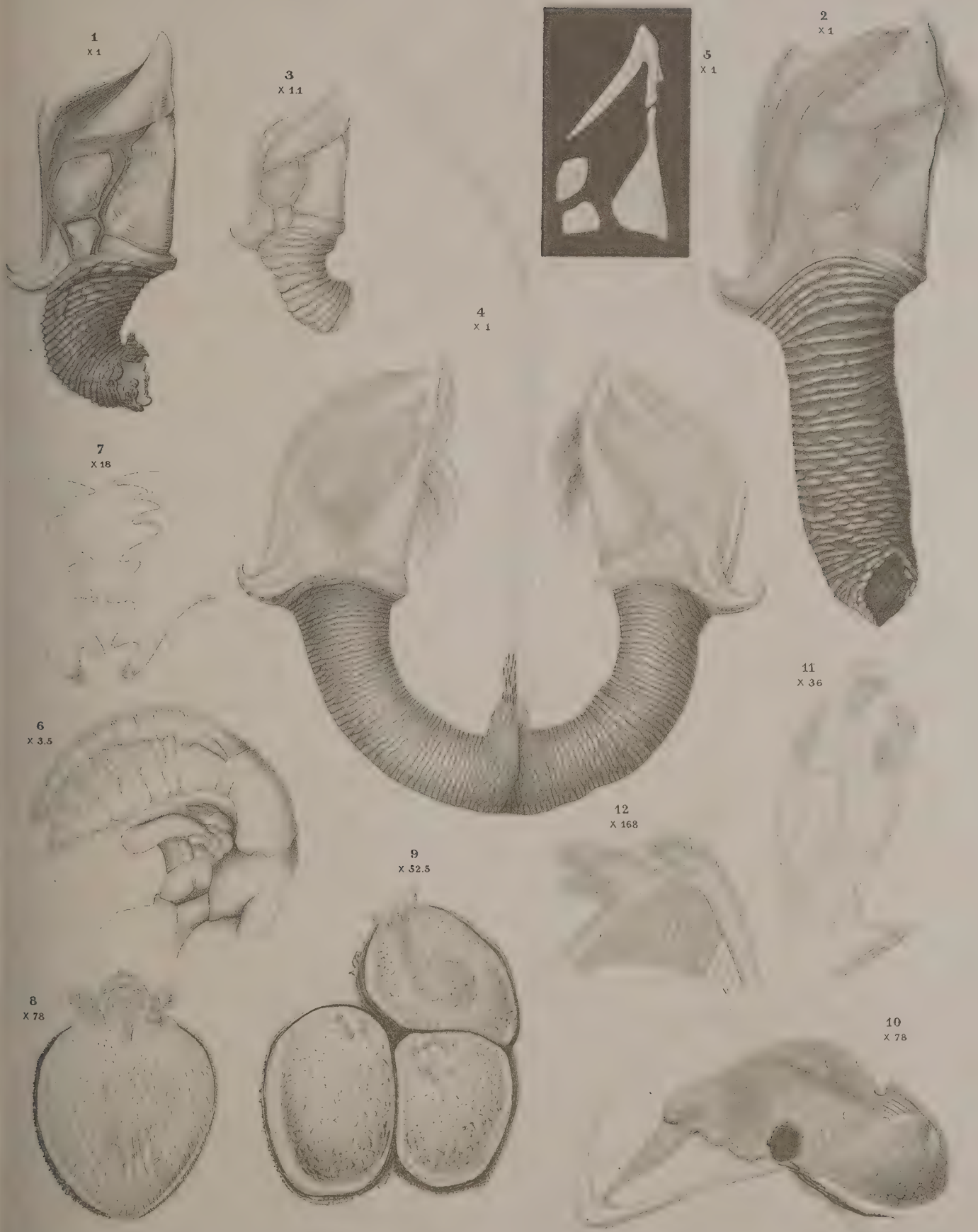
PLATE VI

Fig. 1. *Scalpellum Stearnsi* Pilsbry.
Fig. 1. Animal seen from the left side; natural size.

Fig. 2—3. *Scalpellum Stearnsi* Pilsbry, var. *robusta* n. var.
Fig. 2. Animal seen from the left side (Station 5); natural size.
Fig. 3. Idem (Station 254); magnified 1,1 diameters.

Fig. 4—7. *Scalpellum Stearnsi* Pilsbry, var. *gemina* n. var.
Fig. 4. Two specimens attached to a sponge (Station 74); natural size.
Fig. 5. Valves, isolated; natural size.
Fig. 6. First cirrus; magnified $3^1/_2$ diameters.
Fig. 7. Edge of mandibles; magnified 18 diameters.

Fig. 8—12. *Scalpellum Stearnsi* Pilsbry, var. *robusta* n. var.
Fig. 8. Male; magnified 78 diameters.
Fig. 9. Group of three males; magnified 52,5 diameters.
Fig. 10. Young animal creeping out of the Cypris-shell; magnified 78 diameters.
Fig. 11. Young animal, recently attached; magnified 36 diameters.
Fig. 12. Extremity of capitulum with the primary scutum and tentacles of the young animal of fig. 11; magnified 168 diameters.



1, 2 et 4 G. S. Hoek, ceter P. P. C. Hoek del.

SCALPELLUM.

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PLATE VII

Fig. 1. *Scalpellum acutum* Hoek. Male, magnified 78 diameters.
Fig. 2. *Sc. uncus* n. sp., magnified 5,6 diameters.
Fig. 3. *Sc. uncus* n. sp. Male, magnified 52,5 diameters.
Fig. 4. *Sc. chitinosum* n. sp., magnified 1,1 diameters.
Fig. 5. *Sc. inflatum* n. sp., magnified 1,1 diameters.
Fig. 5*a*. *Sc. inflatum* n. sp. View of rostrum, sketch. *r.* rostrum; *r.l.* rostral latus; *sc.* scutum.
Fig. 6. *Sc. javanicum* n. sp., magnified 1,1 diameters.
Fig. 6*a*. *Sc. javanicum* n. sp. View of basis of carina, sketch.
Fig. 7. *Sc. javanicum* n. sp. Male, magnified 52,5 diameters.
Fig. 8. *Sc. curiosum* n. sp., magnified 5,6 diameters.
Fig. 8*a*. *Sc. curiosum* n. sp. View of rostrum, sketch.
Fig. 8*b*. *Sc. curiosum* n. sp. View of basis of carina, sketch.
Fig. 9. *Sc. polymorphum* n. sp. form A, magnified 3,2 diameters.
Fig. 9*a*. *Sc. polymorphum* n. sp. form A. View of rostrum, sketch.
Fig. 10. *Sc. polymorphum* n. sp. form B, magnified 2,8 diameters.
Fig. 11. *Sc. polymorphum* n. sp. form C, magnified 2,8 diameters.
Fig. 12. *Sc. distinctum* Hoek, magnified 3,2 diameters.
Fig. 13. *Sc. moluccanum* Hoek, magnified 1,1 diameters.
Fig. 14. *Sc. hamulus* n. sp., magnified 1,1 diameters.
Fig. 14*a*. *Sc. hamulus* n. sp. View of rostrum, sketch.
Fig. 15. *Sc. diota* n. sp., magnified 5,6 diameters.
Fig. 15*a*. *Sc. diota* n. sp. View of rostrum, sketch.
Fig. 16. *Sc. sessile* n. sp., magnified 16,4 diameters.
Fig. 17. *Sc. ciliatum* n. sp., magnified 15,5 diameters.
Fig. 18. *Sc. pellicatum* n. sp., magnified 1,1 diameters.
Fig. 18*a*. *Sc. pellicatum* n. sp. View of rostrum, sketch.
Fig. 19. *Sc. pellicatum* n. sp. Caudal appendage; magnified 52,5 diameters.

P. P. C. Hoek del.

SCALPELLUM.

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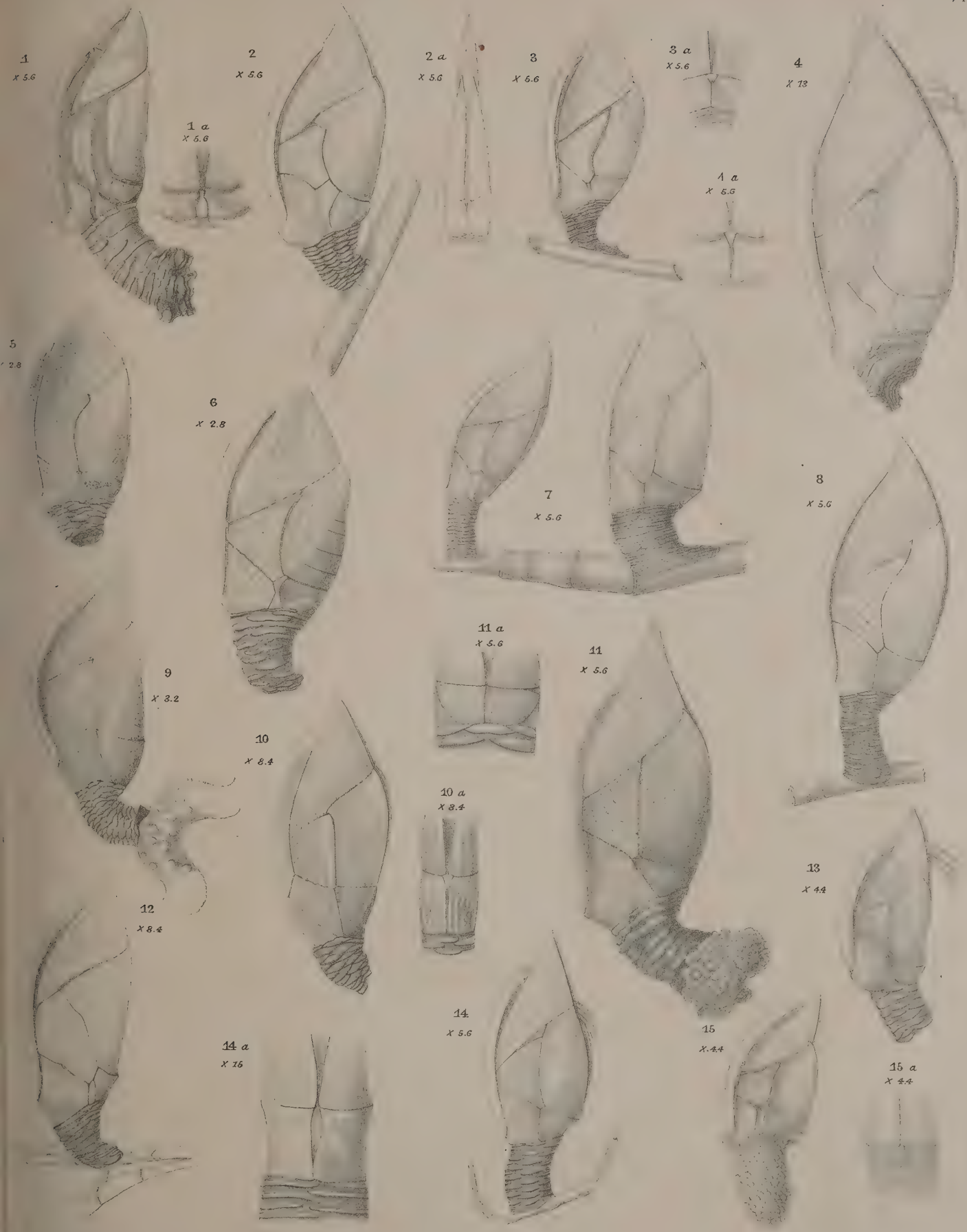
PLATE VIII

Fig. 1. *Scalpellum crinitum* n. sp., magnified 5,6 diameters.
Fig. 1*a*. *Sc. crinitum* n. sp. View of rostrum, sketch.
Fig. 2. *Sc. humile* n. sp., magnified 5,6 diameters.
Fig. 2*a*. *Sc. humile* n. sp. View of rostrum, sketch.
Fig. 3. *Sc. arcuatum* n. sp., magnified 5,6 diameters.
Fig. 3*a*. *Sc. arcuatum* n. sp. View of rostrum, sketch.
Fig. 4. *Sc. poculum* n. sp., magnified 13 diameters.
Fig. 4*a*. *Sc. poculum* n. sp. View of rostrum, sketch.
Fig. 5. *Sc. discolor* n. sp., magnified 2,8 diameters.
Fig. 6. *Sc. trapezoideum* n. sp., magnified 2,8 diameters.
Fig. 7*a*. *Sc. proclive* n. sp., magnified 5,6 diameters.
Fig. 7*b*. *Sc. deforme* n. sp., magnified 5,6 diameters.
Fig. 8. *Sc. gracile* n. sp., magnified 5,6 diameters.
Fig. 9. *Sc. elegans* n. sp., magnified 3,2 diameters.
Fig. 10. *Sc. sculptum* n. sp., magnified 8,4 diameters.
Fig. 10*a*. *Sc. sculptum* n. sp. View of rostrum, sketch.
Fig. 11. *Sc. formosum* n. sp., magnified 5,6 diameters.
Fig. 11*a*. *Sc. formosum* n. sp. View of rostrum, sketch.
Fig. 12. *Sc. hexagonum* n. sp., magnified 8,4 diameters.
Fig. 13. *Sc. praeceps* n. sp., magnified 4,4 diameters.
Fig. 14. *Sc. incertum* n. sp., magnified 5,6 diameters.
Fig. 14*a*. *Sc. incertum* n. sp. View of rostrum, sketch.
Fig. 15. *Sc. imbricatum* n. sp., magnified 4,4 diameters.
Fig. 15*a*. *Sc. imbricatum* n. sp. View of rostrum, sketch.



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SCALPELLUM.

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PLATE IX

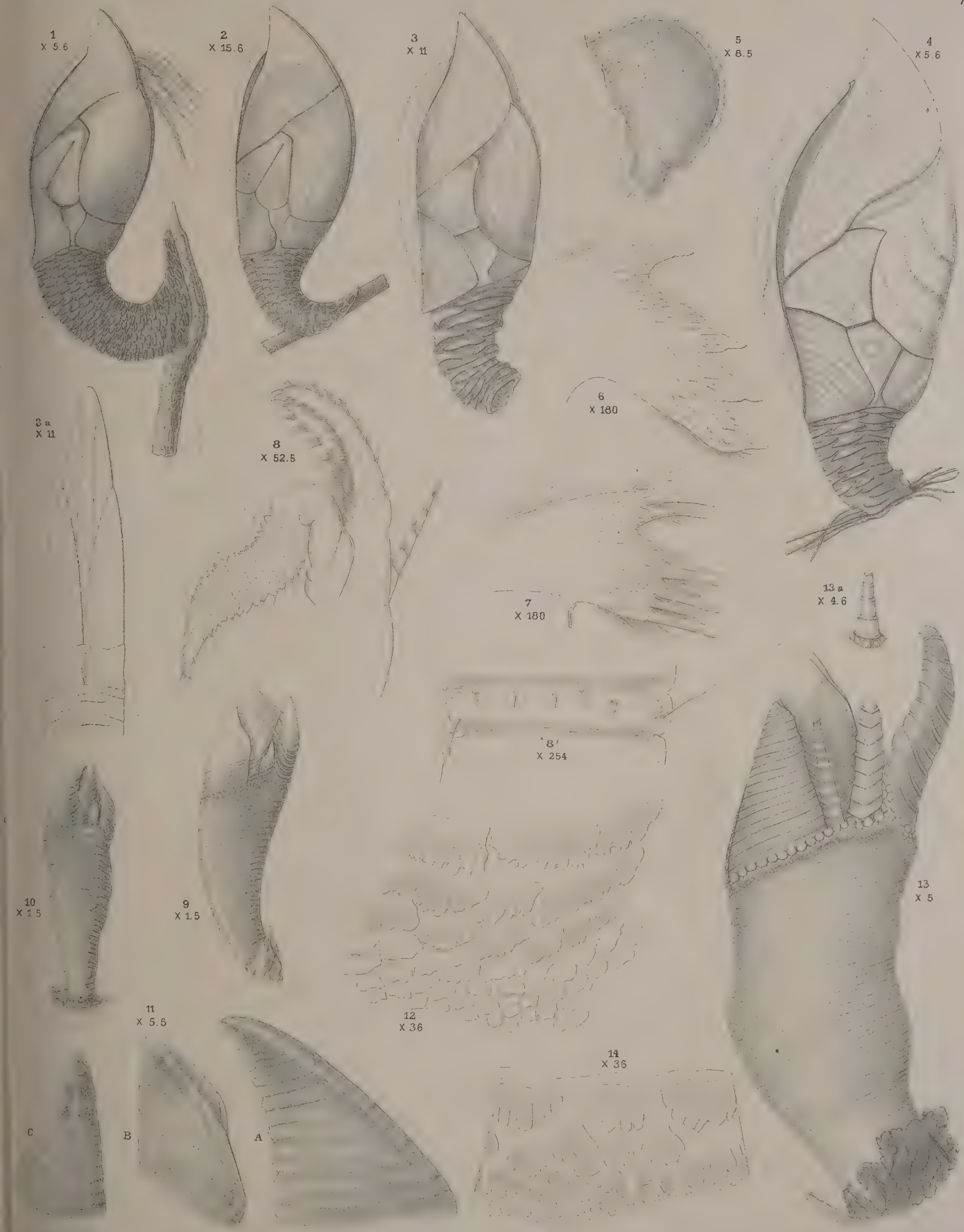
Fig. 1. *Scalpellum fissum* n. sp., with bowed carina, magnified 5,6 diameters.
Fig. 2. *Sc. fissum* n. sp., with straight carina, magnified 7,8 diametres.
Fig. 3. *Sc. candidum* n. sp., magnified 11 diameters.
Fig. 3*a*. *Sc. candidum* n. sp. View of rostrum, sketch.
Fig. 4. *Sc. virgatum* n. sp., magnified 5,6 diameters.

Fig. 5—8′. *Alepas lithotryae* n. sp.
- Fig. 5. Animal, lateral view; magnified 8,5 diameters.
- Fig. 6. Mandible; magnified 80 diameters.
- Fig. 7. Maxilla; magnified 180 diameters.
- Fig. 8. Cirrus of 6th pair, caudal appendage, penis; magnified 52,5 diameters.
- Fig. 8′. One of the rings of the penis; magnified 254 diameters.

Fig. 9. *Lithotrya nicobarica* Reinhardt, magnified 1,5 diameters.

Fig. 10—12. *Lithotrya conica* n. sp.
- Fig. 10. Animal, lateral view; magnified 1,5 diameters.
- Fig. 11. Valves, magnified 5,5 diameters. *A*. Scutum; *B*. Tergum; *C*. Carina.
- Fig. 12. The scales of the peduncle immediately beneath the capitulum; magnified 36 diameters.

Fig. 13, 13*a* and 14. *Lithotrya pacifica* Borradaile.
- Fig. 13. Animal, lateral view; magnified 5 diametres.
- Fig. 13*a*. Rostrum; magnified 4,6 diameters.
- Fig. 14. The scales of the peduncle immediately beneath the capitulum; magnified 36 diameters.



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SCALPELLUM—ALEPAS—LITHOTRYA.

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PLATE X

Fig. 1*a*—1*d*. *Poecilasma dubium* n. sp. Four specimens with abnormal capitulum; magnified 10,5 diameters.

Fig. 2—5. *Poecilasma fissum* Darwin.

Fig. 2. Maxilla; magnified 78 diameters.

Fig. 2*a*. Clawlike spines at the upper angle of the maxilla, notch with the minute hairs; magnified 254 diameters.

Fig. 3. Second maxilla; magnified 78 diameters.

Fig. 4. Spines at the extremity of the 8th segment of the 6th cirrus; magnified 254 diameters.

Fig. 5. Pedicel of 6th cirrus, root of penis and caudal appendage; magnified 78 diameters.

Fig. 6—7. *Poecilasma eburneum* Hinds.

Fig. 6. Second maxilla; magnified 78 diameters.

Fig. 7. Spines at the extremity of the 8th segment of the 6th cirrus; magnified 180 diameters.

Fig. 8—16. *Microlepas diademae* n. sp.

Fig. 8. Capitulum attached to a spine of *Diadema saxatile* L.; magnified 3,6 diameters.

Fig. 9. Mandible; magnified 72 diameters.

Fig. 10. Maxilla; magnified 72 diameters.

Fig. 11. Second maxilla; magnified 72 diameters.

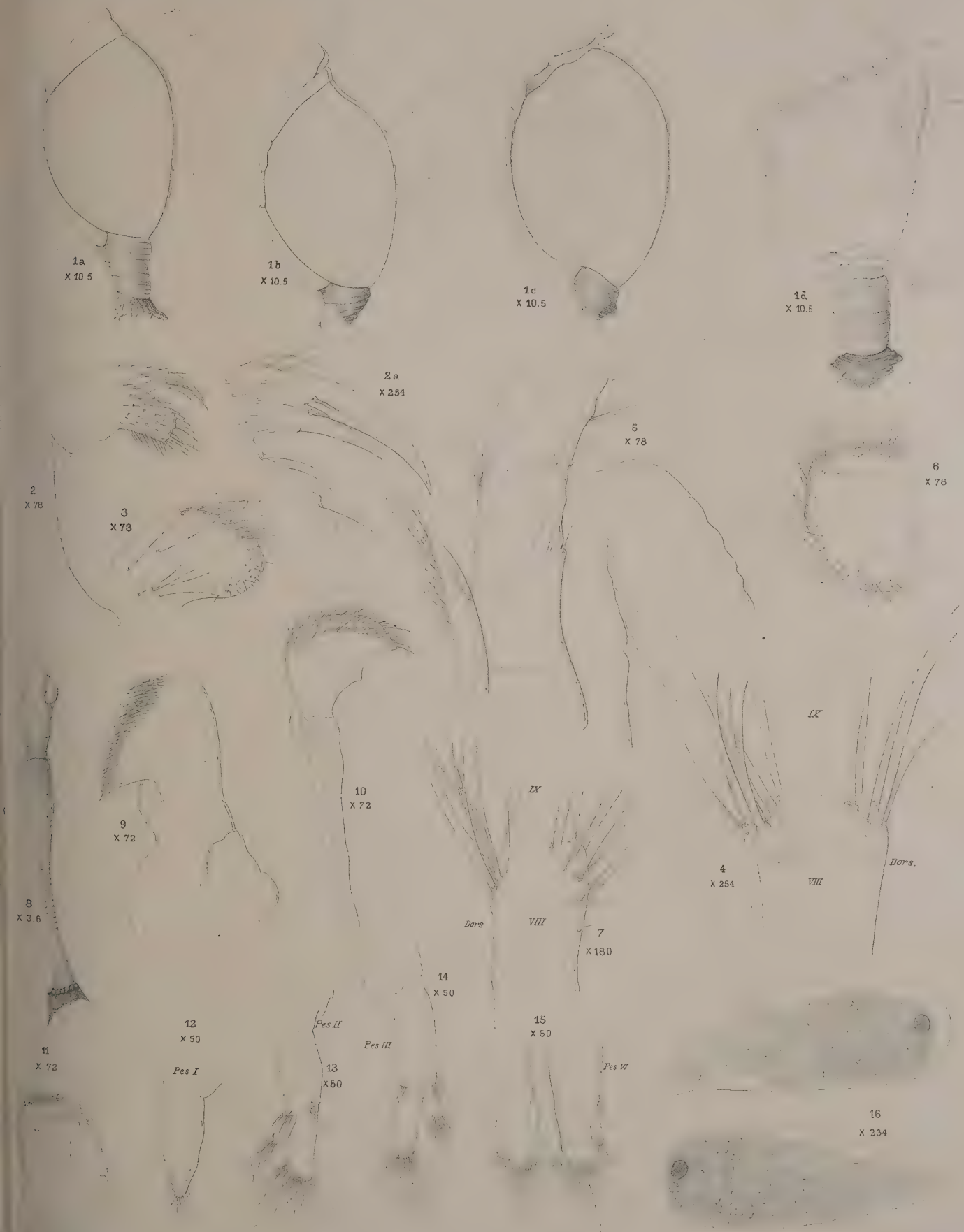
Fig. 12. Cirrus of the first pair; magnified 50 diameters.

Fig. 13. Cirrus of the second pair; magnified 50 diameters.

Fig. 14. Cirrus of the third pair; magnified 50 diameters.

Fig. 15. Cirri of the sixth pair and penis; magnified 50 diameters.

Fig. 16. Two eggs with the nauplius-larvae developed; magnified 234 diameters.


1a
X 10.5
1b
X 10.5
1c
X 10.5
1d
X 10.5
2a
X 254
2
X 78
3
X 78
5
X 78
6
X 78
10
X 72
9
X 72
8
X 3.6
11
X 72
12
X 50
Pes I
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X 50
Pes II
Pes III
14
X 50
15
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Pes IV
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Dors
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THE CIRRIPEDIA OF THE SIBOGA-EXPEDITION

B. CIRRIPEDIA SESSILIA

Siboga-Expeditie
XXXI b

THE CIRRIPEDIA OF THE SIBOGA-EXPEDITION

BY

P. P. C. HOEK

B. CIRRIPEDIA SESSILIA

With 17 plates and 2 textfigures

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PUBLISHERS AND PRINTERS
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B. CIRRIPEDIA SESSILIA

Genus **Verruca** Schumacher

Of this genus GRUVEL, in 1905, knew 25 species, a very considerable number when we consider that, in 1883, before my Report on the Challenger Cirripedia was published, only four species were known.

The deep-sea exploration, however, added largely to that number:

6 new species were collected by the "Challenger" (HOEK[1]),

7 new species were collected during the cruises of the "Hirondelle" and "Alice" (AURIVILLIUS[2]),

and 8 new species were collected by the "Travailleur" and the "Talisman" (GRUVEL[3]).

The richness in species of this deep-sea genus seems by no means exhausted; according to the results of the dredgings published of late:

4 new species were collected by the "Investigator" (GRUVEL[4]),

1 new species was collected by the "Belgica" (HOEK[5]),

5 new species were collected by the "Albatross" (PILSBRY[6])

and 6 new species were collected by H. M. "Siboga" (HOEK) which will be described in this Report.

This augmentation has been especially important for the sixth province (Indian Archipelago and Eastern coasts of India), as proposed by me (l. c. p. 33) for the geographical distribution of the Cirripedia. Only one species of *Verruca* (*Verruca nitida*, collected by the "Challenger" to the South of Mindanao) was known from that region in 1883 and this number has been increased to eleven by the 4 species collected by the "Investigator" and 6 by the "Siboga".

All these species were taken from deep water, as can best be seen from the following table, in which they have been placed according to the depth at which they were found:

Verruca multicostata Gruvel, Strait Malacca, 160 m.
Verruca plana Gruvel, Andaman Islands, 380—465 m.
Verruca Koehleri Gruvel, Andaman Islands, 435 m.

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[1] HOEK, P. P. C., Cirripedia of the Challenger Expedition. 1883.

[2] AURIVILLIUS, CARL W. S., Cirrhipèdes nouveaux provenant des campagnes scientifiques de S. A. S. le Prince de Monaco. Bull. Soc. Zool. de France, XXIII. 1898. p. 189—198.

[3] GRUVEL, A., Cirrhipèdes des Expéditions scientifiques du "Travailleur" et du "Talisman". 1902.

[4] GRUVEL, A., Cirrhipèdes operculés de l'Indian Museum de Calcutta. Mém. Asiatic Soc. Bengal, II. 1907. p. 1—10, pl. I—II.

[5] HOEK, P. P. C., Cirripedia. Résult. Voyage Belgica. Zool. 1907. p. 1—9. 4 fig.

[6] PILSBRY, H. A., The Barnacles in the U. S. National Museum. Bulletin 60 of U. S. National Museum. 1907.

Verruca grex n. sp., Malay Archipelago at different places. 450—984 m.
Verruca conchula n. sp., South of Timor, 520 m.
Verruca conchula var. minor n. var., Kei Islands, 310 m.
Verruca capsula n. sp., Malay Archipelago at different places, 520—1300 m.
Verruca cristallina Gruvel, Andaman Isl. 768—785 m.
Verruca cassis n. sp., Malay Archipelago at different places, 794—1600 m.
Verruca nitida Hoek, Near Talaut Isl. and Strait of Makassar, 915—1300 m.
Verruca casula n. sp., Between Ceram and New Guinea, 924 m.
Verruca navicula n. sp., Malay Archipelago at two different places, 924—959 m.

Of the new species, one (*Verruca cassis*), was found at 4 Stations, two (*Verruca capsula* and *V. grex*) at 3, one (*Verruca navicula*) at 2, and two (*Verruca casula* and *conchula*) each at 1 Station. Of the last-named species, a variety was found at another Station. Some Stations seem to be very favourable for the growth and development of species of this genus, e. g. the Stations 88 and 170, where two, and the Station 297, where three, different species of *Verruca* were collected. One should be cautious, however, in attaching too much value to such particulars, since dredging, especially at great depths, is a haphazard way of exploring the bottom of the ocean. Our knowledge of the distribution of these species, in consequence, is as yet very imperfect.

All the species collected by H. M. S. "Siboga" are true deep-sea species; they were collected at depths varying from 310—1600 m. Shallow water forms, such as *Verruca strömia* O. Müller, do not seem to occur in the East Indian waters. Although most of the shallow water and shore species of this genus (*V. strömia*, *V. laevigata* and *V. Spengleri*) have depressed shells, the species collected in deeper water are not depressed, but have more or less perpendicular walls. Of the species described by Darwin (l. c. p. 523) this is the case in *V. nexa* only. Darwin obtained this species from the West Indies and found it attached to a *Gorgonia*, but the place and depth where it was collected is not mentioned. It can be said, however, that the genus *Verruca*, like *Scalpellum*, was introduced into the zoological system from specimens collected in shallow water and distributed over different seas of the world and that it was not until later that it was found to have a great bathymetrical range and to include many deep-sea species. It can now be considered best as a deep-sea genus, a few only of the species of which occur in shallow water.

The new species here described are, I think, very characteristic ones and will be easily recognised should they turn up again. *V. cassis* may, perhaps, be an exception which will be found later to be identical with *V. cristallina* Gruvel, or not to differ sufficiently to maintain it as a different species. *V. capsula* resembles *V. magna* Gruvel in several characters; there are, however, sufficient grounds to consider these two forms as different species.

1. *Verruca capsula* n. sp. Pl. XII, fig. 1—3. Pl. XIII, fig. 1—4.

Shell somewhat depressed, with the basis broad, irregularly circular; moveable valves nearly parallel to the basis. Moveable scutum and tergum each with three articular ridges. Second

articular ridge of the tergum about three-fourths the length of the axial ridge, hardly shorter than the first. Scutal margin of the rostrum and tergal margin of the carina forming together a straight line. Rostrum and carina nearly of the same size, articulating with one another with from six to eight interlocking ridges.

This characteristic species is the only species of *Verruca* collected by H. M. S. "Siboga" which belongs to those which have the moveable valves almost parallel to the basis and accordingly nearly perpendicular to the parietes (Pl. XII, fig. 1 and 2). It is the largest of the species collected by the Siboga, and at the same time one of the largest of the known species. Seen from the side of rostrum and carina it looks nearly symmetrical, seen from the side of the fixed scutum and tergum, in some specimens, the carinal side is more depressed than the rostral side, in other specimens this difference does not exist. The shells are dirty white; in some instances numerous specimens of very unequal size (and, no doubt, age) form groups, and are attached, partly to one another and partly so closely to one another, as to interfere with their normal growth and development.

The moveable scutum (Pl. XII, fig. 3*a*) is relatively large; its shape is irregularly triangular with the apex strongly beaked. The irregularity of its shape is caused by the tergal margin having an excrescence formed by the broadest of the articular ridges, which does not extend to the basi-tergal angle. The basal margin of the valve is perfectly straight, the occludent margin curved. Of the three articular ridges, the axial ridge is narrow, and runs from the apex to the basi-tergal angle; the second ridge increases strongly in breadth from the apex to its inferior extremity, and it has the outer or tergal margin distinctly hollowed out. The so-called first articular ridge is very narrow and not quite half as long as the second. It can be seen best when the valves of a larger specimen are isolated and looked at from the side. On the under side the surface of the scutum is furnished with a very distinct rim along the occludent margin; from this rim, at a short distance from the apex, runs a transverse rim, separating the depression for the adductor muscle from a small triangular depression in which fits part of the scutal shoulder of the tergum. The tergal margin along this triangular portion is double, the interior margin representing the first articular ridge as indicated above.

The moveable tergum (Pl. XII, fig. 3*b*) is less than twice as large as the moveable scutum; it is broad and its shape is irregularly rhomboidal. Its scutal margin is characterised by a deep, rounded excavation, its basal margin is perfectly straight, one of its occludent margins (the longer) is feebly curved, the other being slightly hollowed out; a bluntly beaked apex is formed, where the two occludent margins meet. Externally three ridges are seen: a rather prominent axial ridge fitting with its basis against the axial ridge of the scutum; a middle (second) articular ridge, broad at the basis and much shorter than the axial ridge and the so-called first articular ridge, the free margin of which forms the shorter occludent margin of the valve. The broad extremity of this first or upper articular ridge is covered by the scutum and forms what might be called the scutal shoulder of the tergum fitting in the triangular depression at the under side of the scutum. The under side of the moveable tergum (Pl. XII, fig. 3*b*) is flat and shows only two shallow grooves near the scutal margin. Along the two occludent margins the valve is bordered by distinct rims, which at the underside project over the surface.

Rostrum and carina are of nearly the same shape and size. From the middle of the front of the shell, where these two valves meet, they bend over to the sides of the same, where they overlap the margins of the fixed scutum and tergum with triangular portions growing broader towards the basis of the shell. Both valves have the upper margin of the front part perfectly straight and the umbo at the extremity of that margin; their basal margin is arched, each equalling about one fourth the circumference of a circle. From the upper margin where the nearly horizontal moveable valves are attached to the basis, the whole shell increases considerably in width and this is the case especially with that part of the wall which is formed by the rostrum and the carina. The strongly curved surface of both valves shows numerous irregular ridges of growth. The suture with which the two valves articulate is not straight, but shows numerous teeth growing smaller from the upper margin towards the basis. These teeth form the extremities of as many oblique ridges (interlocking folds) running from the apex of the valve to the rostral margin of the carina or to the carinal margin of the rostrum. The number of these ridges seems to increase with age: I counted from 6—8 of them in different specimens.

The fixed scutum and tergum form the remaining part of the wall. They do not increase so much in width from the upper margin downwards, and their position is much steeper in consequence. The fixed scutum is larger than the fixed tergum; it consists of a triangular middle part, the tip of which nearly touches the apex of the moveable scutum, and the basal margin of which is rather long and distinctly curved; of a broad triangular lateral part, the upper margin of which as occludent margin forms part of the edge of the shells orifice and the basis of which does not quite reach the basis of the shell. This lateral triangular portion is overlapped by the lateral margin of the rostrum, forming here a kind of a radius. The third part of the fixed scutum is narrow, it increases slightly in breadth from above downwards and overlaps the scutal margin of the fixed tergum. The structure of the latter valve is nearly the same: it also has a triangular middle part, the tip of which is opposed against the tip of the moveable tergum and two triangular lateral parts, one side of which as occludent margin forms part of the edge of the orifice of the shell. The triangular portion situated at the side of the fixed scutum is overlapped by the narrow radius-like part of that valve, that at the side of the carina is also overlapped by a triangular kind of a radius forming the lateral part of the carina. The surface of these valves is smooth and irregularly folded; distinct growth ridges are visible on the surface of the triangular parts, the upper margins of which form the occludent margins of these valves.

The form of the basis is irregularly circular, the transverse diameter (that which runs parallel to the basal margin of the moveable valves) is slightly longer than the diameter which is vertical to this direction.

The size of this species is relatively large: it seems to be one of the largest of the genus. In the specimen figured the dimensions are:

height about 10 mm.

greatest diameter of the basis 14.5 mm.

distance from the apex of the rostrum to that of the carina 10 mm.

In the largest specimen collected the corresponding measurements are: 11, 16.5 and 13 mm.

With regard to the structure of the animal's body, the following may be of interest:

Mouth flattened, at a considerable distance from the adductor scutorum muscle; crest of labrum with a row of over thirty small conical teeth; palpi rather narrow, elongately conical, slightly curved, with the tip rounded; numerous short hairs on the surface and a few longer ones, distinctly curved at and near the extremity, along the outer margins.

Mandible (Pl. XIII, fig. 1) with three teeth and the inferior angle narrow and pectinated at the extremity. The anterior or upper margin of the inferior angle is furnished with a row of eight teeth, growing stouter from above downwards. Distance between tips of first and second teeth between one and a half and twice the distance between second and third.

Maxilla (Pl. XIII, fig. 2) with a distinct notch beneath the three upper spines. The upper margin of the step-formed projection long, bearing five short spines. The edge of the same projection relatively short and bearing about seven longer and stouter spines, with a few shorter ones near the inferior angle.

Outer maxillae (Pl. XIII, fig. 3) with the inner surface indistinctly bilobed, the outer surface rounded and clothed with numerous hairs of which the inferior ones are the longest.

Cirrus of the first pair attached near to each side of the mouth, with nearly equal rami of 14 segments thickly clothed with spines.

Cirrus of the second pair with very unequal rami of 12 and 26 segments, the longer more than twice as long as the shorter ramus. All segments thickly clothed with spines; the segments of the shorter ramus broader, those of the longer ramus, especially the more distal ones, more elongated.

Rami of cirrus of the third pair slightly unequal: the shorter with 32, the longer with 34 segments. The lower segments have the anterior margin furnished with three pairs of spines, and the lateral face bears numerous spines as well as a group of two or three on the posterior margin near the extremity of the segment; the middle segments have the same pairs along the anterior margin, a row of spines along the upper margin, and also bear spines near the extremity of the segment at the posterior margin; the last segments have the spines only near the extremity and those along the anterior margin.

Rami of cirrus of the fourth pair equal, with 37—38 segments. Each segment has 3 pairs of spines along the anterior margin and a couple of bristles at the posterior near the extremity of the segment. The lower segments show a few very delicate hairs distributed over the lateral faces.

Rami of cirrus of the fifth pair equal, with 40—41 segments; hardly any bristles on the lateral faces of the segments, those along the anterior margin and at the extremity of the segments on the posterior margin as usual.

Rami of cirrus of the sixth pair equal, with 44 segments; spines as on the cirri of the fifth pair.

Of the spines along the anterior margin of the cirri of the 3rd—6th pair those forming the second and third pair are very long, those of the first or lowest pair, on the contrary, are as a rule short and very delicate.

Caudal appendage unusually short, having about half the length of the first

segment of the pedicel of the sixth cirrus. It has 8 quadratic segments; the first however, is more elongate, as are also the two last ones (Pl. XIII, fig. 4). Hairs disposed in a dense group at the inner side near the extremity of each segment and in smaller number at the outer side. The hairs at the inner side on the lower segments very long, those on the following segments not quite so long, the hairs disposed lower down reaching nearly as far with their extremities as those of the last segments. Last segment obliquely truncated, with a group of hairs on the tip.

Penis short, reaching as far as the middle of the second segment of the pedicel of the sixth cirrus. Narrow, bluntly pointed at the extremity. Here and there a single hair disposed on its surface. A young specimen was furnished with a very short penis, the length of which equalled two-thirds of that of the caudal appendage.

This species was collected by H. M. S. "Siboga" at the following places:

Stat. 88. June 20, 1899. Lat. 0° 34′.6 N., Long. 119° 8′.5 E. Depth 1301 m. Bottom: fine grey mud. About six specimens, some of them very large.

Stat. 262. December 18, 1899. Lat. 5° 53′.8 S., Long. 132° 48′.8 E. Depth 560 m. Bottom: solid bluish-grey mud. Two specimens, one attached to a *Hexelasma*, the other to a small stone.

Stat. 297. January 27, 1900. Lat. 10° 39′ S., Long. 123° 40′ E. Depth 520 m. Bottom: soft grey mud. One specimen, attached to the shell of a Gastropodous mollusc.

General Remarks. This species resembles *Verruca magna* Gruvel, from the Gulf of Gascogne. As the articular ridges of the moveable valves of the two forms are slightly different and as the rostrum and carina of the Siboga-animals are much larger than in *V. magna*, I have thought it better to describe the form occurring in the Malay Archipelago as a distinct species. It is certainly nearly related to the Atlantic form.

2. *Verruca navicula* n. sp. Pl. XII, fig. 4—6. Pl. XIII, fig. 5—7.

Shell not depressed, plan of the moveable valves vertical to the basis. Moveable valves large, the scutum with 5, the tergum with 7 articular ridges. Apex of the carina slightly produced, rounded, that of the rostrum hardly produced, but also rounded. Carina and rostrum having one longitudinal rim and articulating with one another with a single tooth. Fixed scutum and tergum relatively large, having a great elevation and articulating with one another by means of two articular ridges.

This beautiful species (Pl. XII, fig. 4 and 5) is characterised in the first place by the great number of articular ridges on the moveable valves, and in the second place by the high elevation of these valves and of the fixed scutum and tergum also. The rostrum and carina are on the contrary more developed in breadth than in height. On all the parts of the shell the lines of growth are very distinct; the surface of the fixed tergum and scutum and of the rostrum and carina is furnished, moreover, with very characteristic folds, the direction of which is perpendicular to that of the lines of growth.

This species is represented in the Siboga collection by two specimens, of which, however, one only can be considered as full-grown.

The moveable scutum has the apex distinctly beaked and projecting freely. Its shape

is elongately triangular, its height being almost twice the length of the basis. Its occludent margin is curved, its basal margin straight, its tergal margin straight also, yet furnished with numerous indentations. The outer surface shows numerous articular ridges, the most pronounced of which, the axial articular ridge, describes a distinct arch and runs from the basi-tergal angle to the apex. Four other ridges occupy the interspace between the axial ridge and the tergal margin, and run parallel to each other, and each following one is shorter and less strongly curved than the preceding one. Each ridge, moreover, grows slightly broader towards the under extremity and is distinctly divided by transverse lines corresponding with the growth ridges of the valve itself. The fourth of these ridges is the shortest; it is nearly straight and runs along the tergal margin of the valve.

The moveable tergum is large and quadrangular. Of the occludent margins the longer is feebly curved and the shorter slightly hollowed out; they meet at the apex which is distinctly beaked. The scutal margin is nearly straight, yet furnished with indentations in which fit the teeth of the tergal margin of the scutum; the basal margin is nearly straight, or, perhaps, feebly curved, but l. c. this could be decided only by isolating the different valves, which I have not thought desirable. The outer surface of the tergum shows a strongly developed and curved axial articular ridge, which widens considerably towards the scuto-basal angle; it has moreover a distinct marginal ridge along the shorter occludent margin and five intermediate ridges nearly filling up the whole interspace between the two first described. These five ridges run nearly parallel to the axial ridge and to each other; from the apex down to the scutal margin of the valve each ridge grows wider and slightly diverges; each of their extremities forms one of the teeth for the articulation of this valve with the moveable scutum. All these ridges are transversely divided by furrows which correspond with the growth ridges on the surface of the remaining part of the valve.

The carina and rostrum have both an irregular quadrangular shape, the carina being a little higher, the rostrum a little broader. The apices of both valves project freely, and slightly beyond the edge formed by the other valves. The carina is furnished with a distinct furrow, running at some distance from the tergal margin towards the apex of the valve. At the inferior extremity of this furrow an indentation is seen on the rostral margin, in which fits the tooth-like point of the rostrum at the scuto-carinal angle of that valve. For the rest the suture between the rostrum and carina is straight and has no teeth or indentations. The surface of the rostrum is divided into two triangular parts by a rim running from the basi-carinal margin to the apex: from this rim the lines of growth run parallel to the carinal margin in the upper part and parallel to the basal margin in the lower part. The surface of the latter, as also that of the part of the carina which lies beneath the furrow, and more distinctly so towards the basal margin of the valve, is not smooth, but folded, the folds being perpendicular to the growth ridges.

The fixed scutum and tergum have also a very characteristic structure. The fixed tergum is composed of two parts: a triangular portion which is very narrow at the apex and slightly broader in its inferior half where it articulates with the lateral margin of the carina, and a flat and broad part at the hinder portion of the shell. The latter part is irregularly quadrangular,

and again divided into two parts by a ridge running from the apex downwards. At a little distance from the apex this ridge begins to show traces of teeth and these grow more distinct downwards; at the same time a second row of teeth gradually shows itself along the outer row. These teeth form the lateral extremities of the growth ridges, which here generally run parallel to the basal margin. The same ridges run parallel to the scutal margin of the valve on the other part of the fixed tergum, viz. that part which lies between the ridge and the fixed scutum.

The fixed scutum has a pointed and distinctly beaked apex and is composed of a broader, nearly flat, triangular portion and a narrower inflected portion which only widens somewhat towards its inferior extremity. The tergal margin is hollowed out and furnished with a row of teeth, which project over the margin of the tergum and which stand at the place of the kind of radius developed at the tergal margin of the scutum in other species of *Verruca*. The ridges of growth are distinct, their direction is very irregular, yet they, generally, run parallel to the basal margin of the valve. In the inferior part of the valve these growth ridges are produced laterally into distinct teeth, forming together a row which runs nearly parallel to the row of teeth which was compared with the radius of the scuta of other species of *Verruca*. Here and there, and especially on the inferior half of the surface of the fixed tergum and scutum, are vertical folds, of varying width and of a very unequal distinctness.

The basis of the shell is elongately oval in shape and is, probably, membranous, as in the other species of the genus. The large specimen is attached to a bundle of presumably siliceous needles, the smaller to a single slightly stronger needle.

The size of the large animal can be judged from the following dimensions: height 11 mm., distance from the apex of the rostrum to that of the carina 9.5 mm. The young specimen has the same dimensions 2.9 and 3 mm. respectively.

A figure of the young specimen is given on Pl. XII, fig. 6. I think there can be no doubt but that it really is a young specimen of the species described above. The general shape of the shell and of the different valves is already much like that of the full-grown animal. The differences are to be considered as caused by the difference of age. Briefly, these differences are as follows:

1 the intermediate articular ridges of the tergum, i. e. those between the axial and the feebly indicated ridge along the shorter occludent margin are partly developed only: in fact their basal portions only can be made out;
2 the articular ridges of the scutum also are only partly developed;
3 the rim running over the rostrum from the carino-basal angle to the apex is still wanting, the lines of growth in the upper and lower triangular portions of the valve being still continuous; and
4 the furrow of the carina is represented by a rather indistinct line only.

For the study of the growth of the valves of species of this interesting genus, and for the determination of younger specimens also of other species, I thought it would be of interest to point out these differences for the present species.

I sacrificed the smaller specimen in order to investigate the structure of the animal's body and with regard to this the following may find a place here.

The body is much flattened and the distance between the mouth and the adductor scutorum muscle is large.

The mouth is not bullate; the crest of the labrum is surmounted by 40—50 extremely small conical teeth. Numerous delicate hairs, directed towards the mandibles, are disposed on the surface. Palpi rather short, conical, with numerous hairs on the outer side and at the extremity.

Mandible (Pl. XIII, fig. 5) with three teeth and inferior angle pectinated as usual. The upper margin of the third tooth has a couple of additional small teeth and the upper (or anterior) margin of the inferior angle is serrated with about five sharply pointed teeth, the size of which increases from above downwards. Distance between tips of first and second teeth about one and a half times the distance between second and third.

Maxilla (Pl. XIII, fig. 6) with the three relatively strong upper spines; the notch is not deep, but rather wide, and has one short spine at the upper margin near the three upper spines, and two short spines at the inferior margin, which is the upper margin of the step-formed projection. The latter has about 6 spines along the outer edge, one of which is longer and slightly stouter than the others.

The outer maxillae have the interior surface feebly lobed, the outer clothed with numerous rather long and curved bristles.

Cirri. Cirrus of first pair standing near the mouth at some distance from the other pairs. This distance, however, is smaller than in the other species of the genus. Rami very unequal in length: the shorter is considerably broader and has 8—9, the longer has narrower segments the number of which is 13—14.

Cirrus of second pair has the longer ramus about twice as long as the other; the latter has 6—7 somewhat broader, the former 13—14 slightly longer and narrower segments. The distal segments of the shorter ramus short and square at the tip.

The cirri of the posterior pairs have numerous slightly elongated segments; as a rule they are not protuberant in front; they bear at that side two pairs of slender spines and a third pair of much smaller spines. The dorsal tuft has one long and a few shorter and more delicate spines. The cirri of the 4th—6th pairs are longer than those of the third pair and still increase in length from the 4th to the 6th. The rami of the last pair are composed of 23—24 segments.

Caudal appendage very long, about half the length of the cirrus of the last pair. Number of segments 21. Length of last segments (Pl. XIII, fig. 7) more than six times their breadth. Numerous delicate spines are disposed at the extremity of each segment.

This species was dredged by H. M. S. "Siboga" at the following places:

Stat. 52. April 20, 1899. Lat. 9° 3′.4 S., Long. 119° 56′.7 E. Depth 959 m. Bottom: globigerina ooze. One specimen, attached to a bundle of siliceous needles of a sponge?

Stat. 170. August 26, 1899. Lat. 3° 37′.7 S., Long. 131° 26′.4 E. Depth 924 m. Bottom: fine grey mud. One smaller specimen, attached to a glass needle.

General Remarks. This is a very characteristic species. It is recognisable at once by

the height of the moveable tergum and scutum and the numerous ridges which serve for the articulation of these valves.

3. *Verruca cassis* n. sp. Pl. XI, fig. 1—6. Pl. XII, fig. 7—8. Pl. XIII, fig. 8—10.

Shell not depressed, moveable valves nearly perpendicular to the surface of attachment. Moveable tergum with five longitudinal ridges, moveable scutum also with five ridges, the fifth extending along the middle articular ridge on the side of the occludent margin of the valve. Carina with the apex rounded at the tip and slightly produced only, much smaller than the rostrum. Apex of rostrum rounded, not produced. Carina and rostrum articulating with 4 to 5 teeth which diminish in size towards the basal margin. Fixed tergum and scutum articulating with the aid of two narrow and somewhat indistinct ridges.

Several specimens of a *Verruca* were collected at different stations in the Malay Archipelago, at depths varying from 800 to 1600 m., and, although differing in certain characters from each other, must all be considered as belonging to one and the same species. The differences must be attributed, I think, partly to differences in age, partly to differences in the surface of attachment, which is very narrow for specimens attached to sponge-needles and broader for those attached to stems of a different nature.

The colour of the shell is white in young specimens and dirty-yellowish in older; traces of a chitinous membrane are here and there visible. The growth-ridges are not very distinct on the rostrum and carina but can distinctly be made out on the moveable valves as well as on the fixed scutum and tergum. The moveable valves are relatively large, the rostrum rather bulky and broad; the broken line of articulation between rostrum and carina is not near the middle of the front side of the shell but towards its carinal side (Pl. XII, fig. 7 and 8).

The moveable scutum (Pl. XI, fig. 1) is not very small, its area equalling about two-thirds of that of the moveable tergum. Its shape is triangular, the occludent margin strongly curved, the basal margin almost at right angles to the tergal margin and more than half as long as that margin. The tergal margin shows five rather blunt excrescences or teeth: the apex of the valve being the first, the extremity of the axial ridge the fifth of these teeth; the basal margin has two such blunt excrescences, one at the extremity of the axial ridge and one at the extremity of the fifth ridge which runs along the axial one. Of these ridges the first is short, narrow and indistinct: only visible when the valve is isolated; the second is much broader and extends to about half the length of the tergal margin; the third is slightly narrower than the second, distinctly curved, extending to within a short distance from the extremity of the fourth or axial ridge. This axial ridge is very prominent, curved and grows broader from the apex towards the basi-tergal corner, where it projects freely. The fifth is about as broad and strong as the axial ridge, but its extremity can hardly be said to project freely, though forming a little excrescence on the basal margin of the valve. This fifth ridge is hardly visible in the smaller, no doubt younger, specimen. The part of the valve which is enclosed between the last (fifth) articular ridge and the occludent margin is relatively narrow and shows, especially in the inferior part, distinct ridges of growth which run parallel to the basal margin.

The moveable tergum (Pl. XI, fig. 2) is rather broad and quadrangular. The axial ridge, which is to be considered as the fifth ridge, is beautifully curved, grows wider from the apex towards its inferior extremity and projects freely at the basi-scutal corner of the valve. The part of the valve between the axial ridge and the curved longer occludent margin is flat, has a triangular shape and shows distinct growth-ridges, which run parallel to the perfectly straight basal margin. The part of the valve between the axial ridge and the nearly straight shorter occludent margin has a triangular shape also, but its surface is not flat but divided into ridges separated by more or less distinct furrows. Of these ridges the first runs along the shorter occludent margin of the valve: it is narrow, slightly shorter than the second and can only be made out when the valve is isolated. The second is broader, especially towards its free extremity, which projects as a tooth on the scutal margin of the valve. The third is shorter than the second and the fourth, but, like the other ridges, it grows broader towards the scutal margin of the valve. The fourth is the broadest of all, it is distinctly curved and its surface is convex; its extremity projects slightly — not so strongly as the second and fifth ridges — on the scutal margin of the valve. The scutal margin shows altogether only three distinct excrescences or teeth, the extremities of the first and third articular ridges not projecting at all.

The rostrum (Pl. XI, fig. 3) is large, bulky, of a quadrangular shape. It is strongly convex, especially in its inferior part; it has the basal margin distinctly curved, the upper margin hollowed out. A rim along the upper margin is divided into two or three little teeth, which serve for the articulation of the scutum with this valve, and also to support the extremity of the big upper tooth of the carina. The carinal margin is furnished with five teeth (when fullgrown), four in the younger specimens; these teeth diminish in size from the upper towards the basal margin of the valve. Near the carinal margin the surface of the valve is distinctly undulated, the crests of the waves being only feebly prominent however, and not distinctly ringed. In other specimens more distinct prominent ridges could be made out, their direction being from the carinal margin to the scuto-lateral angle of the valve.

The carina (Pl. XI, fig. 4 and 4*a*) is parallelogram-shaped as far as the part of the valve situated at the side of the moveable valves is concerned; a smaller triangular part of the valve forms a sharp angle with the main part and bends over to the side of the fixed scutum and tergum. The upper margin of the main part is convex, its lateral margin nearly straight, its basal margin more or less irregular according to the convex surface of the object to which the shell is usually attached. The rostral margin has the same number of teeth as the carinal margin of the rostrum, their size corresponding with the excavations of the other valve. The undulations of the surface are, as a rule, slightly better developed than on the rostrum. The triangular part which bends over to the side of the fixed tergum shows distinct growth-ridges, and the upper margin rests against the basal margin of the carinal-lateral portion of the fixed tergum.

The fixed tergum (Pl. XI, fig. 5) has the ordinary shape: a well developed middle portion of triangular shape and two triangular lateral portions. One of these is situated at the carinal side of the valve: it has a rather long and convex occludent margin and a shorter and excavated basal margin; it describes a distinct angle with the middle portion, to which it is attached by a rather long and concave margin. The remaining lateral portion, which might be called the

scutal lateral portion, is smaller: it has a straight occludent margin, an excavated basal margin, and a convex lateral margin. The middle portion shows near its base and at the scutal margin of the valve two feebly developed rims, serving for the articulation of the valve with the fixed scutum. The upper part of the whole valve is reflected, so that its outer surface is distinctly concave.

The fixed scutum (Pl. XI, fig. 6) is broader, but perhaps not quite so high as the fixed tergum. Its shape is irregularly quadrangular, with the upper or occludent margin convex, the rostral margin nearly straight, the long basal margin irregularly convex, according to the surface of the object to which the shell is attached, the tergal margin is hollowed out and furnished with a kind of radius and a rim along the basal portion of the margin, both serving for the articulation with the fixed tergum. The outer surface of the valve shows distinct ridges of growth, the direction of which, however, is rather irregular. From the slightly beaked apex to the basi-rostral angle of the valve a feebly-undulating line divides the valve into two triangular portions which together make a very blunt angle; the whole valve is, moreover, not flat but laterally bent towards the side of the moveable valves.

The size of the shell as shown in the middle-sized specimen figured on Pl. XII figs. 7 and 8 is 4.5 mm. height measured from the basal margin of the rostrum to the apex of the tergum; 3.5 mm. distance from apex of carina to that of the rostrum. These measurements are slightly smaller in some of the other specimens. In the largest specimen of all, taken at Station 43, the height measured 5.2 mm., the distance between the apex of rostrum and carina more than 4 mm.

The study of the animal's body has given the following results:

The body as a whole is much flattened, the prosoma is slender, the cirri rather long.

Mouth laterally compressed, the anterior median line rounded but not bullate. Crest of labrum with more than 20 small teeth on each side; palpi elongately triangular, with the inner margin slightly hollowed out, the outer margin convex and the tip bluntly pointed. A row of short hairs is disposed along the inner margin, those at and near the extremity being a little longer and curved. Over the outer surface a few shorter hairs are scattered.

Mandible (Pl. XIII, fig. 8) as usual: with three teeth and the inferior angle terminating in a group of about 4 short spinelike, flattened teeth. The distance between the extremities of teeth 1 and 2 little more than twice as long as that between teeth 2 and 3. The first tooth long and pointed, teeth 2 and 3 shorter and not pointed at the extremity. The upper margin of tooth 2 shows an indication of an accessory tooth, that of tooth 3 is furnished with such an accessory tooth, and the upper or anterior margin of the inferior angle with a row of 5 or 6 of such accessory teeth, of which the most inferior one is the longest and stoutest. Inferior angle short, not produced.

Maxilla (Pl. XIII, fig. 9). Notch beneath the three upper spines hardly indicated, the lower part, however, distinctly projecting forward. In the interspace between the three upper spines and the projecting inferior part two spines are disposed. The inferior part bears half a dozen stronger spines and a group of about 5 shorter and more delicate spines near the inferior angle.

Outer maxillae with the inner face distinctly bilobed and numerous curved hairs disposed along the outer margin and over part of the outer surface.

Cirrus of the first pair situated very near the mouth with slightly unequal rami, both

composed of 11 segments. The terminal segments of the longer ramus are slightly longer than those of the shorter ramus. The six inferior segments thickly clothed with hairs, the remaining segments with few hairs on the surface but with a well developed row of stronger hairs near the extremity.

Cirrus of second pair has also slightly unequal rami: a shorter ramus composed of 11 broader and a longer ramus of 13 somewhat longer segments. Hairs scattered over the whole surface of the segments, more thickly disposed on the segments of the shorter ramus. The hairs of the longer ramus are longer and more delicate.

Cirrus of third pair has 15 and 17 segments in the slightly unequal rami. Hairs on the lower segments numerous, irregularly disposed; grouped in pairs along the anterior margin of the distal segments, one pair moreover being disposed on the posterior margin, near the extremity of each segment.

In the cirri of the fourth-sixth pairs the number of segments gradually increases. Those of the last pair have 28 segments in each ramus. The number of pairs of spines on the anterior side is 3 as a rule, those of the third or most inferior pair being always extremely delicate.

The caudal appendage is very long and slender. It has about 26 segments and reaches with its extremity beyond the extremity of the 12th segment of the sixth cirrus. Very long and delicate hairs form a wreath at the extremity of some of the segments and are almost entirely absent at the end of others: See Pl. XIII, fig. 10. Length of last segments about four times their breadth.

The penis is relatively thick at the base, much narrower at the extremity. Its surface is distinctly ringed and delicate hairs are scattered over the rings and grow more numerous towards the extremity.

This species was collected at the following Stations:

Stat. 45. April 6, 1899. Lat. 7° 24′ S., Long. 118° 15′.2 E. Depth 794 m. Bottom: fine grey mud. Five specimens in two lots, all of them attached to cylindrical black sticks of a nature unknown to me.

Stat. 46a. April 7, 1899. Lat. 8° 0′.5 S., Long. 118° 34′.7 E. Depth 1600 m. Bottom: mud. Two specimens attached to a black cylindrical stick.

Stat. 151. August 12, 1899. Lat. 0° 12′.6 S., Long. 129° 48′ E. Depth 845 m. Bottom: fine grey mud. Numerous specimens attached to a small bough or stem, which is hollow, and the nature of which is unknown to me.

Stat. 284. January 18, 1900. Lat. 8° 43′.1 S., Long. 127° 16′.7 E. Depth 828 m. Bottom: grey mud. One specimen attached to the needle of a glass-sponge.

General Remarks. The specimens from the different Stations and even those of one Station are slightly different from one another — yet there can be no question about their belonging to the same species. The most important differences are those in the distinctness of the line running parallel to the axial ridge, on that part of the scutum and tergum which lies between that ridge and the occludent margin; next, in the size and development of the teeth with which rostrum and carina articulate together, and finally in the greater or lesser distinctness of the grooves on the surface of the rostrum.

Of the known species, *V. cassis* comes nearest to *V. cristallina*, Gruvel, the main

difference being that the surface of the rostrum in the latter species shows very prominent articular ridges, whilst these are absent, hardly visible or slightly prominent only in *V. cassis*. The articular ridges of the fixed tergum, moreover, which are well developed in *V. cristallina*, show themselves only as feebly developed rims in *V. cassis*.

4. *Verruca grex* n. sp. Pl. XI, fig. 7—13. Pl. XIII, 11—13.

Shell not depressed, moveable valves nearly perpendicular to the surface of attachment, compartments broad, base also broad but very narrow. Moveable scutum and tergum each with four articular ridges. Rostrum, seen from the front, triangular and somewhat elevated, carina elongate and horizontally extended, articulating with the rostrum by means of one strong and three smaller teeth. Rostrum bending over to the side of the fixed scutum and tergum with a triangular part. Fixed scutum much larger than fixed tergum, the latter bending over to the side of the moveable valves with a triangular part.

This interesting species was collected at several Stations. As a rule, numerous specimens are attached to the same spine of an Echinid (Pl. XI, fig. 7). The shell is white, its form very characteristic, which is due partly to its obliqueness, the moveable valves overhanging more or less towards the side of the carina, partly to the shape of carina and rostrum and to the way in which these compartments are articulated together (Pl. XI, fig. 8 and 9).

The moveable scutum (Pl. XI, fig. 10) is relatively large, triangular, with the occludent margin very strongly curved, the basal margin nearly straight and the tergal margin with four shallow indentations in which fit the rounded extremities of the articular ridges of the moveable tergum. The apex is distinctly beaked; the part of the surface not occupied by the articular ridges shows very pronounced ridges of growth and is, moreover, longitudinally striped with shallow grooves. In this way a rather distinct fifth articular ridge is separated from the remaining part, close along the main or axial ridge. The latter ridge is the longest of all; it is strongly curved and runs from the apex to the basi-tergal angle, where its extremity forms a slightly projecting spur. The succeeding ridges are parallel to the main ridge, but each is shorter and slightly less curved than the preceding.

The moveable tergum (Pl. XI, fig. 11) is quadrilateral and nearly rhombiform. Its two occludent margins meet in a rather blunt angle; its basal margin is slightly convex and forms an obtuse angle with the extremity of the axial ridge. Its scutal margin shows indentations corresponding with the extremities of the articular ridges of the scutum. The main articular ridge is nearly straight, slightly curved only near the apex of the valve; it grows distinctly broader to the basi-scutal angle, where it forms a spur-like excrescence. The following articular ridges are all nearly straight, decreasing in length, so that the last one forms at the same time the shortest of the two occludent margins of the valve. The latter ridge is longitudinally furrowed and might in consequence be counted as two. The part of the valve between the axial ridge and the longest of the two occludent margins is triangular, shows distinct growth ridges and a few shallow grooves which run nearly parallel to the occludent margin.

The rostrum is rather stout; a large triangular part of it is situated at the side of

the moveable valves, a smaller part, also of triangular shape, is bent over to the side of the fixed compartments. The larger part is strongly developed longitudinally, its elevation surpassing considerably that of the carina. It might again be considered as composed of two parts: one between the basal margin of the valve and the crest of the angle formed with the part on the other side of the shell, and one between the carinal margin and the upper or scutal margin of the valve. These two parts are separated from each another by means of a stronger ridge, which runs almost longitudinally. Along this ridge two other less prominent ridges may be seen, each terminating in a slightly prominent tooth, serving for the articulation of this valve with the carina. A fourth articular ridge runs along the scutal or upper margin of the valve and forms at its basal extremity, i. e. at the scuto-carinal angle, a larger tooth, fitting in an excavation of the rostral margin of the carina. The surface of this valve has distinct growth-ridges and is, moreover, irregularly folded, the folds not reaching to the apex of the valve.

The carina is broad or wide, not high. Its surface is distinctly bowed longitudinally as well as transversely, its shape being in consequence elongately spoon-like. Its upper or tergal margin is short and concave, its basal margin is much longer and convex. The basal part of the valve is somewhat curved over the rounded-spine to which the shell is attached and thus a small part of its margin is seen when looking at the shell from the side of the fixed scutum and tergum. The lateral margin of the valve is short, and articulates with the triangular part of the fixed tergum, which bends over to the front of the valve. The rostral margin of this valve is long and shows four excavations in which fit the extremities of the four articular ridges of the rostrum. The widest of these excavations is that for the reception of the strong tooth of the rostrum at its scuto-carinal angle. The part of the valve along the rostral margin develops into a kind of articular ridge and running parallel to it are two other ridges, which, however, can best be seen at their extremities where they project as teeth, which fit between the teeth at the extremity of the articular ridges of the rostrum. The carina shows also growth-ridges, and the part of the surface near the lateral margin is, moreover, distinctly folded, the direction of the folds changing from longitudinal, near the lateral margin, to nearly transverse parallel to the growth ridges.

The fixed scutum (Pl. XI, fig. 12) is considerably larger than the fixed tergum. It is more than one and a half times as broad as high. Its basal margin is long, slightly convex and shows numerous shallow excisions corresponding to vertical folds at the outer surface of the valve. The tergal margin is short and shows at the outer side a narrow radius, overlapping the fixed scutum at its scutal margin. On the inner surface there is, near the distinctly beaked upper angle, an excavated part bordered by a ridge and serving for the reception of the upper angle of the fixed tergum. The occludent margin is concave and relatively long, the lateral margin is composed of a short upper part, which lies along the upper part of the scutal margin of the rostrum, and a longer under part along the lateral margin of the rostrum. The latter part of the margin has an irregular, sinuous course. The valve itself is divided into three parts: a large triangular part between the basal margin and a somewhat curved rim running from the basi-rostral angle to the apex; a triangular part along the occludent

margin, which cannot be seen when looking at the shell from the side of the fixed valves, but which is very distinct when the valve is isolated and looked at from the inner side (Pl. XI, fig. 12). The third part lies between the two, its shape is also triangular and it extends from the apex to the lateral margin of the valve. In this part the growth ridges run nearly longitudinally, but as the valve is here somewhat hollowed out longitudinally, the course of the growth ridges is not straight but undulating.

The fixed tergum is composed of two parts standing at right angles to one another: the part at the hinder portion of the valve, which is overlapped by the tergal margin of the fixed scutum, is the larger one, and has an irregular quadrangular shape. Its upper margin forms part of the occludent margin and is relatively short; its basal margin is considerably longer and distinctly undulating. It has a very irregular scutal margin (Pl. XI, fig. 13) and its fourth margin forms the edge of the angle with the other part of the valve. The shape of the latter is triangular, it has a short basal margin and its free lateral margin lies partly as occludent margin along the larger occludent margin of the moveable tergum, partly along the lateral margin of the carina. This part of the valve is like the other but is more strongly ribbed longitudinally, the ribs growing more prominent towards the base of the valve.

Size. The distance from the apex of the rostrum to that of the carina is in one of the largest specimens 6 mm.; the greatest height of the same shell is 4.5 mm., the greatest dimension of the base, measured along the spine to which it is attached, is 8.3 mm.

The study of the structure of the animal's body has given the following results:

Mouth much flattened laterally. Labrum rounded anteriorly but not bullate. Crest with a row of teeth, about 15 on each side; ten of these on each side from the middle have the apex with two or even three points, the remaining five at both extremities of the crest having the ordinary triangular shape, the most distal teeth being very small. Palpi rather large, broad at the base, bluntly pointed at the extremity, with a row of short bristles along the inner margin and a tuft of longer hairs at the extremity. A few short bristles scattered over the outer surface.

Mandible (Pl. XIII, fig. 11) much as usual in this genus; distance between tips of first and second teeth almost twice as long as that between second and third. Inferior angle moderately produced, terminating in a group of four small teeth. Teeth on the front side of the inferior angle at their bases fused together in a kind of crest, the tips of five or six of them emerging above the margin of the crest.

Maxilla (Pl. XIII, fig. 12) with short spines and a very shallow notch. Of the three upper spines the third is very delicate and lies against the second. 3 or 4 small spines are disposed in the notch, whereas the somewhat projecting inferior part bears half a dozen of spines, of which one is longer and slightly stouter; a group of numerous small spinelike hairs occupies the edge of the inferior angle.

Second maxillae small, outer margin rounded, inner margin with a shallow notch, and indistinctly bilobed. Surface with short hairs as usual.

Cirri. Cirrus of first pair with very unequal rami: the long ramus has 21 segments and is slender, the short one has 9—10 segments, and is broad and somewhat curved. Of the latter all the segments are densely clothed with hairs; of the long ramus the seven lower segments

have numerous hairs disposed on the surface, the more distal segments having hairs almost exclusively round the base of each following segment.

The second cirrus also has very unequal rami: the short ramus has 7 segments and looks as if it was truncated at the extremity; the long one has 20 segments, increasing slightly in length, but decreasing considerably in breadth towards the extremity of the ramus. Shorter ramus and lower 6—7 segments of the longer ramus thickly clothed with hairs.

The third cirrus has shorter rami than the 4th—6th cirri. Surface of the lower 10 segments densely clothed with hairs in both rami. Number of segments 16 in the shorter, 18 in the longer ramus.

The fourth-sixth cirri have slightly longer rami — but even these cannot be said to be very long. The number of segments seems to increase from the 3rd to the 6th: at least I found in a specimen the following numbers:

3rd cirrus . . .	16 and 18 segments
4th cirrus . . .	19 and 20 segments
5th cirrus . . .	22 and 22 segments
6th cirrus . . .	23 and 24 segments.

All the segments of the 4th—6th cirri bear at the anterior side two pairs of stronger and a third pair of delicate bristles; at the posterior side near the extremity of each segment a few delicate spines, which on the more distal segments are almost rudimentary.

The caudal appendage is very slender; I counted 25 segments in one of them. Length of last segments (Pl. XIII, fig. 13) about four times their breadth.

The penis is thick, broad at its base, tapering towards the extremity. It is distinctly ringed and bears delicate hairs scattered over its surface; at and near the extremity, the hairs are disposed much more densely.

This species was collected at:

Stat. 74. June 8, 1899. Lat. 5° 3′.5 S., Long. 119° 0′ E. Depth 450 m. Bottom: Globigerina ooze (obviously a thin layer). Numerous specimens attached to the spines of *Cidaris (Histocidaris) elegans* Alex. Agassiz.

Stat. 267. December 20, 1899. Lat. 5° 54′ S., Long. 132° 56′.7 E. Depth 984 m. Bottom: grey mud with a brown upper layer. Six specimens, two of them attached to a spine of *Cidaris misakiensis* Yoshiwara, the others loose; the latter have also been attached to a cylindrical object.

Stat. 297. January 27, 1900. Lat. 10° 39′ S., Long. 123° 40′ E. Depth 520 m. Bottom: soft grey mud with brown upper layer. One specimen attached to a spine of *Cidaris japonica* Döderlein.

General Remarks. This is a very peculiar species of *Verruca*. It shows some resemblance to *V. radiata* Gruvel in the structure of the moveable valves, although the articular ridges of the scutum, which in *V. radiata* are very narrow, are quite broad in *V. grex*. The shape of the fixed valves and of the rostrum and carina especially, is quite different from what we find in other species of the genus.

The number of specimens on the same spine of a *Cidaris* is sometimes considerable.

There are spines with one or two specimens only, there are others with 5 or 6 or more specimens, and there is even a spine with 12 specimens attached to it.

This species seems to range over a considerable depth: there are specimens found at 450, 520 and 984 m.

5. *Verruca conchula* n. sp. Pl. XI, fig. 14 and 15.

Shell not depressed, plan of the moveable valves in the same direction as that of rostrum and carina. Moveable tergum with three articular ridges, scutum also with three articular ridges as well as three prominent ridges between its axial ridge and its occludent margin. Carina small, with the apex projecting freely; rostrum large, with numerous and very prominent ridges, cup-shaped, turned over with its base to the side of the fixed valves. Fixed scutum laterally turned over to the side of the moveable valves.

This beautiful but curious species is represented by a single specimen only. It is a small shell, the largest diameter being under 6 mm. It is loose and has been attached, to judge from the form of its base, laterally against a cylindrical object, part of the outer surface of which is still to be seen adhering to the membrane representing the basis. The colour of the shell is dirty white, yellowish. It is recognisable at once by the numerous and prominent ridges, or ribs with rounded surface, especially on scutum and rostrum, and also on part of the fixed scutum and the carina (Pl. XI, fig. 14). The whole shell has an irregular globular shape, but the rostrum particularly is very distinctly convex, markedly bent over to the side of the fixed valves.

The moveable scutum is relatively small, triangular, with the occludent margin very strongly convex, the basal margin nearly straight but having three excavations, in which fit the extremities of as many ribs of the rostrum, and the tergal margin irregularly toothed and with excavations between the teeth. Besides the three ordinary, true articular ridges, the third of which is more strongly developed and represents the axial ridge, the surface of the scutum shows three other longitudinal and rather prominent ridges on that part which is between the axial ridge and the occludent margin. Of the articular ridges, the first extends to about the middle of the tergal margin, the second to where it meets the main articular ridge of the tergum, and the third to the basi-tergal angle of the valve.

The moveable tergum is rhomboidal in shape, and distinctly, though not sharply beaked. The longest occludent margin is convex, the shortest hollowed out, the scutal margin irregularly toothed, the basal margin straight. The part of the surface between the main articular ridge and the convex occludent margin shows distinct lines of growth running parallel to the basal margin; the rest of the surface is occupied by the three articular ridges: the main or axial, which is strongly convex and runs from the apex till the basi-scutal angle, the middle ridge, which is broad and also convex, and the first, which runs along the occludent margin and can hardly be distinguished from it.

The carina is rather small and has the apex projecting beyond the basi-carinal angle of the tergum. Its shape is triangular; its tergal margin is straight, the margin forming the

basal edge slightly sinuous, and the rostral margin irregularly toothed. The surface shows deep longitudinal furrows running from the apex to the rostral margin and separating from one another four prominent ridges, the one running along the tergal margin being by far the broadest.

The rostrum is patelliform and much larger than the carina; it might also be compared with a hand, the palm of which is small and the fingers numerous, narrow and strongly curved. The latter are represented by the prominent ridges, which extend to the scutal and carinal margins of the valve and fit between the extremities of the ridges on the surface of scutum and carina. I wished to keep the single specimen intact, and since the margins of the different valves can be made out with certainty only by isolating them, it is quite possible that figure 14 of Pl. XI is not absolutely correct with regard to the course of these margins — in the main, however, the figure will be found to represent them as they are.

The basal edge of the rostrum, like that of the carina, is inflected inwards and forms a kind of ledge round the basal aperture of the shell.

The fixed scutum is broad, its apex obtuse; it overlaps the scutal triangular part of the fixed tergum with a small radius. An important part of this valve is bent over to the side of the moveable valves, and in consequence the whole valve has somewhat the shape of a cap. The portion of the valve situated at the side of the moveable valves has on its surface several prominent ribs or ridges, running parallel to those on the moveable scutum. They extend further than these, however, and go beyond the basal margin of the moveable scutum. So the inferior parts of these ribs run for a short extent parallel to some of the ribs on the surface of the rostrum, which extend to the basal extremities of the ribs on the moveable scutum.

The fixed tergum is smaller than the fixed scutum. It consists of three parts: the triangular and distinctly beaked middle part, the scuto-lateral part, which is also triangular and is overlapped partly by the radius of the fixed scutum, and the occludent lateral part which is inflected towards the side of the moveable tergum, the free margin of which runs parallel to the occludent margin of that valve. The surface of the fixed tergum is nearly perfectly smooth, like that of the fixed scutum.

The membrane (fig. 15 *m*) representing the basis of the shell is partly seen in the oval basal aperture of the shell; at the side of the fixed scutum and tergum it still adheres to the outer surface of the object (ibid. *b*) to which it has been attached; at the side of the rostrum and carina part of the basal membrane is wanting and in consequence a view of the interior (part of the ovary (ibid. *o*) etc.) is possible.

Size. The height of the shell is about 5 mm., the distance from the apex of the rostrum to that of the carina 5.6 mm.

This specimen was collected by H. M. S. "Siboga" at

Stat. 297. December 27, 1899. Lat. 10° 39′ S., Long. 123° 40′ E. Depth 520 m. Bottom: soft grey mud with brown upper layer.

General remarks. The form of the scutum with its numerous ridges is rather like that of *V. nexa* Darwin. Yet the present species has the scutum slightly larger and shows a further longitudinal ridge. There seems to be some likeness between the two species

in other characters, as for example in the shape of the rostrum, but the differences are more obvious. The carina and the fixed valves do not at all resemble those of *V. nexa*.

Verruca conchula, var. *minor*, nov. var. Pl. XI, fig. 16 and 17.

In the Kei Islands Archipelago two small specimens of a *Verruca* were dredged. These show great resemblance to the *V. conchula* just described but differ, however, in certain characters from the specimen used for that description. I consider this form to be a variety, since I do not believe that the differences are caused by difference in age, as might be supposed, because the animals from the Kei Islands are considerably smaller, their largest diameter measuring 3 mm. only. Although the general shape corresponds fairly well, the carina has a somewhat different form, in consequence of the apex not only projecting beyond the basi-carinal angle of the tergum, but being also distinctly recurved. The rostrum is different also, since the ridges, which in *V. conchula* are disposed to a large extent on the circumference of a central part which I compared with the palm of a hand, in this variety can be followed, though not very distinctly, over the whole surface of the valve. Finally there is an important difference in the way in which the fixed scutum and tergum in the variety are interlocked, each valve having distinct articular ridges which interlock between the articular ridges of the other valve (fig. 17). Such indentations are not seen along the adjoining margins of the fixed scutum and tergum in *V. conchula*.

It is possible, that the variety described here may later be found to represent a different species, and I consider this to be more probable than its being regarded as a younger specimen of *V. conchula*.

This small species was collected at:

Stat. 254. December 10, 1899. Lat. 5°40′ S., Long. 132°26′ E. Depth 310 m. Bottom: fine grey mud. Two small specimens attached to a rounded stick of unknown nature. One specimen only is complete, the other has no moveable valves.

6. *Verruca casula* n. sp. Pl. XIII, fig. 14 and 15.

Shell white, walls perpendicular to the surface of attachment, moveable valves almost parallel to the walls. Moveable scutum with two articular ridges running close together, moveable tergum with two articular ridges also, but separated from one another by an interspace of triangular shape. Apex of the carina pointed, but hardly projecting freely; that of the carina neither pointed, nor projecting. Rostrum and carina articulating together by means of a well-developed and broad tooth on the rostrum, fitting between two feebly-indicated teeth of the carina. Basis narrow, oval.

This species is represented by a single specimen of small dimensions. Its perpendicular compartments are well-developed; in consequence the shell when seen from the side of the moveable valves has the shape of a quadrangular case with a triangular, pointed

roof above it. The growth-ridges on the different valves are not very prominent, on the rostrum only they are rather distinct and broad.

The moveable scutum has the apex pointed, the tergal margin hollowed out near the apex, and slightly protuberant at the basi-tergal angle; the basal margin is straight and the occludent margin strongly curved. The main articular ridge is distinctly curved, a second ridge runs closely to it, separated from the tergal margin by a flat, narrow part, without a trace of an articular ridge along the tergal margin.

The moveable tergum has the apex slightly produced, but obtuse and not pointed; its shape is nearly regularly rhomboidal with the longer occludent margin curved and the shorter slightly hollowed out. The basal margin is straight, the scutal straight also, with a feeble protuberance near the apex of the scutum and another near the basi-scutal angle. The main articular ridge extends from the apex to the basi-scutal angle and is rather strongly curved; another ridge extends along the shorter occludent margin.

The carina is narrower but perhaps a little higher than the rostrum, its apex is pointed but can hardly be said to project freely. The lateral margin is feebly curved and is visible at the side of the fixed scutum and tergum only; the rostral margin shows a distinct excavation near the upper extremity, for the reception of the rounded tooth on the carinal margin of the rostrum. A triangular portion of the surface of the valve near the tergal margin develops into a slight swelling which forms the continuation of the more pronounced swelling on the surface of the rostrum.

The rostrum has the lateral margin shorter than the carinal; while the former is perfectly straight, the latter has a distinct excrescence near the upper extremity, and forms the rather broad tooth with rounded circumference which fits in the excavation of the rostral margin of the carina. A flat semilunar part of the surface is to be seen along the scutal margin of the valve and is separated from the rest of its surface by a distinctly swollen part which grows broader and more prominent towards the carinal margin, where it terminates into the tooth already mentioned.

The fixed tergum is larger — broader as well as higher — than the fixed scutum. Its occludent margin consists of two parts which closely correspond to the two occludent margins of the moveable tergum; its apex is indistinctly beaked. The valve itself consists of a middle portion and two lateral portions. The middle portion is triangular and curved and terminates in the apex; the lateral portions are triangular also: their upper margins are each formed by one of the parts of the occludent margin of the valve. At the side of the carina the lateral portion is overlapped by a narrow strip of that valve, at the side of the fixed scutum by a kind of radius belonging to the latter valve.

The shape of the fixed scutum is irregularly triangular, broad at the base, pointed at the apex. It overlaps the fixed tergum with a triangular portion representing a radius. This portion of the valve is broadest near the upper extremity and very narrow at its base; its upper margin is hollowed out in a very characteristic manner. The remaining part of the valve consists of the curved and triangular middle part and a lateral part of triangular shape also, the free margin of which is attached to the lateral margin of the rostrum.

Basis. The form of the interspace left open between the basal edges of the parietes is elongated oval, about three times as long as broad.

Size. The height of the shell is 2.5 mm., the distance from the apex of the rostrum to that of the carina 2 mm.

The specimen was found attached to a small piece of stem of *Chrysogorgia flexibilis* which was dredged at

Stat. 170. August 26, 1899. Lat. 3° 37′.7 S., Long. 131° 26′.4 E. Depth 924 m. Bottom: fine grey mud.

General Remarks. This species comes near to *Verruca quadrangularis* Hoek from the South Atlantic, the main difference being that the rostrum of the present species articulates with the carina with one tooth only, and that of *V. quadrangularis* with two teeth; secondly the apex of the carina of *V. casula* does not project freely, while it generally does so in *V. quadrangularis*.

7. *Verruca nitida* Hoek.

Hoek, Cirripedia collected by H. M. S. "Challenger". 1883. p. 138, pl. XII, figs. 6—7.

Only a single specimen of this species was collected for the first time, by the Challenger near the Talauer Islands, between Mindanao (Philippines) and Halmaheira, at a depth of 915 m.

Another single specimen was found attached to one of the specimens of *Verruca capsula* n. sp., which H. M. S. "Siboga" dredged at:

Stat. 88. June 20, 1899. Lat. 0° 34′.6 N., Long. 119° 8′.5 E. Depth 1301 m. Bottom: fine grey mud.

This locality is situated at the northern entrance of the Strait of Makassar. The size of this specimen is: height about 9 mm., distance from the apex of the rostrum to that of the carina 8 mm. It is slightly larger than the specimen of the Challenger, which in other characters resembles it closely.

Genus **Balanus** Auct.

Darwin, in his Monograph (1854), enumerated 45 species of *Balanus*, 39 of which were living, and 6 fossil. In 1905 the number of living species had reached 49: 1 species being added to the list by Filhol [1] (*B. Campbelli*, 1885), 2 by Gruvel [2] (*B. Dybowskii* and *B. violaceus*, 1903), 5 by Hoek [3] (*B. corolliformis*, *hirsutus*, *rostratus*, *socialis* and *tenuis*, 1883), 1 by Lanchester [4] (*B. aeneas*, 1902) and 1 by Fr. Müller [5] (*B. armatus*, 1867): in Gruvel's "Monographie" of 1905 this number (49) of species is given. From 1905 up to the present

[1] Filhol, A., Mission de l'Ile Campbell. Recueil de Mémoires etc. III. 2e partie. Zoologie. 1885. p. 487.

[2] Gruvel, A., Révision des Cirrhipèdes appartenant à la collection du Muséum (Operculés). Nouvelles Archives du Muséum. (4). V. 1903. p. 95.

[3] Hoek, P. P. C., Cirripedia of the Challenger Expedition. 1883.

[4] Lanchester, W. F., Crustacea of the Skeat-Expedition. Proceed. Zool. Soc. London. II. 1902.

[5] Müller, Fritz, Über *Balanus armatus* etc. Archiv f. Naturgeschichte. XXXIII. 1867.

(June 1912) 10 more species were added to the list, viz. 1 by BORRADAILE[1] (*B. maldivensis*, 1903), 1 by GRUVEL[2] (*B. carenatus*, 1907), 1 by KRÜGER[3] (*B. poecilotheca*, 1911) and 7 by PILSBRY[4] (*B. aquila*, *B. Evermanni*, *B. flos* and *B. orcutti* 1907; *B. peruvianus*, 1909; *B. callistoderma* and *B. hoekianus*, 1911). The number of living species known and described at present would thus amount to 59. It is proposed in the present report, to include in a new genus 4 of the species which hitherto were considered to belong to the genus *Balanus*: 2 of HOEK's species of 1883 (*B. corolliformis* and *B. hirsutus*) and 2 of PILSBRY's species of 1911 (*B. callistoderma* and *B. hoekianus*). The number of species of *Balanus* would therefore be reduced to 55. But, since I have now to propose for this genus 16 new species, the total number of known species would at present amount to 71.

According to his Monograph, DARWIN (1854) knew 9 species of *Balanus*, as occurring in the Malay Archipelago. The Challenger (1883) collected in this region two new species of this genus, so that in all 11 species were known from it. The dredgings carried out during the cruise of the Siboga produced specimens of 26 species of the genus *Balanus*. Of these 16 must be considered — as I have already said — as new to science; of the remaining 10, 6 have already been observed in that region, while 4, although known species, are stated for the first time here to occur in the said region: the total number of species known to occur there would thus amount to 31.

I here give a complete list of the species of *Balanus* hitherto collected in the 6th province which I proposed for the distribution of the Cirripedia, and which includes the Malay Archipelago and the eastern coasts of India. The names are given in alphabetical order. Those with an asterisk are species which, according to DARWIN, are found in this region, but which are not represented in the Siboga-collections. Those with a † are species already known for other regions, but which were collected in the Malay Archipelago by the Siboga for the first time.

**B. ajax* Darwin	Philippine Archipelago, attached to Milleporae.	Shallow water.
B. alatus n. spec.	Sulu Sea: Stat. 97.	564 m.
B. albus n. spec.	Bali Sea: Stat. 12; Kei Islands: Stat. 260; (? Sulu Sea: Stat. 95)	90, 289 (? and 522 m.)
B. amaryllis Darwin . . .	Different places: Stat. 50, 258, Jedan Islands. Also India: Mouth of the Indus, Moreton Bay and N. E. coast of Australia.	13—40 m.
B. amphitrite Darwin . . .	Several places throughout the Archipelago. Extremely common outside the Archipelago, e. g. Mouth of the Indus, Ceylon, Australia, etc.	0—56 m.
B. arcuatus n. spec. . . .	Banda.	9—36 m.
B. auricoma n. spec. . . .	Ternate: Stat. 136; (? Kei Islands: Stat. 260).	27 (and ? 90 m.).

[1] BORRADAILE, L. A., Marine Crustaceans (of the Maldive and Laccadive Archipelagoes). The Fauna and Geography of the Mald. and Lacc. Archipel. Part. IV—VII. VII. The Barnacles. 1903.

[2] GRUVEL, A., Cirrhipèdes operculés de l'Indian Muséum de Calcutta. Mém. Asiatic Soc. Bengal. II. 1907. p. 1—10. 2 pl.

[3] KRÜGER, PAUL, Beiträge zur Cirripedienfauna Ostasiens. Abhandl. d. math.-phys. Kl. d. Bayer. Akad. d. Wisschensch. II. Suppl. Bd. 6. Abhandl. 1911. 72 S. 4 Taf.

[4] PILSBRY, HENRY A., Cirripedia from the Pacific coast of North America. Bulletin of the Bureau of Fisheries. Washington. XXVI. 1907.

——, Report on Barnacles of Peru, collected by R. S. COKER and Others. Proceed. U. S. Nat. Museum. XXXVII. 1909. 12 p. 4 pl.

——, Barnacles of Japan and Bering Sea. Bulletin of the Bureau of Fisheries. Washington. XXIX. (1909). 26 p. 10 pl. 1911.

B. bimae n. spec.	Sumbawa, Bay of Bima: Stat. 47.	13—31 m.
†*B. calceolus* Ellis.	Halfway between Misool and New Guinea: Stat. 164. Also India: Tubicoreen, near Madras.	32 m.
B. carenatus Gruvel. . . .	Akyab, Burmah.	
B. ciliatus n. spec.	Molo Street, Westcoast of Flores; South of Rotti: Stat. 299; Between Adonara and Solor: Stat. 305.	34—113 m.
B. compressus n. spec. . .	Between Wowoni and Buton: Stat. 204; South of Timor: Stat. 289.	75—94—112 m.
*B. *concavus* Bronn.	Philippine Archipelago, Australia.	Shallow water.
B. cornutus n. spec. . . .	Halfway between Misool and New Guinea: Stat. 164.	32 m.
B. cymbiformis Darwin. .	Near Madras.	
B. hystrix n. spec.	Ambon-anchorage.	40 m. or less.
B. investitus n. spec. . . .	East of Sumbawa: Stat. 310; (? Kei Islands: Stat. 260).	73—90 m.
B. longirostrum n. spec. .	Anchorage off Dongola, Palos-bay: Celebes.	36 m.
B. maculatus n. spec. . . .	East of Sumbawa: Stat. 49[a]; Ibidem: Stat. 310.	70—73 m.
†*B. maldivensis* Borradaile.	East of Sumbawa: Stat. 49[a] and 310; Molo Street, Westcoast of Flores; South of Samau Isl.: Stat. 59; between Rotti and Timor: Stat. 302. Also: Maldive Archipelago.	54—390 m.
B. minutus n. spec.	North of Kwandang, Celebes: Stat. 117.	80 m.
†*B. navicula* Darwin	South of Halmaheira: Stat. 144. Also: Tubicoreen, Madras.	45 m.
*B. *patellaris* Spengler. . .	Philippine Archipelago; also: Bengal.	Shallow water.
B. pentacrini n. spec. . . .	West of Kei Islands: Stat. 251 and 253.	204—304 m.
B. proripiens n. spec. . .	Between Wowoni and Buton: Stat. 204.	75—94 m.
B. quadrivittatus Darwin.	East Indian Archipelago; Stat. 164. Also: Philippine Archipelago.	32 m.
B. quinquevittatus n. spec.	Halfway between Misool and New Guinea: Stat. 164.	32 m.
B. socialis Hoek.	Labuan Badjo; between Misool and Salawatti and New Guinea: Stat. 162 and 164; ? between Muna and Buton; Saleyer Islands. Also: Arafura Sea.	9—36 m.
*B. *stultus* Darwin	Singapore, attached to Milleporae.	Shallow water.
B. tenuis Hoek.	North of Sulu Islands: Stat. 105. Also: Philippine Archipelago.	275 m.
†*B. terebratus* Darwin . . .	Kei Islands: Stat. 257.	52 m.
B. tintinnabulum Linn. . .	Keel of H. M. "Siboga". Common on ships-bottoms coming from West-Africa, India, China etc.	Surface.
*B. *trigonus* Darwin	Java, East Indian Archipelago. Also: Australia.	Shallow water.

As was the case with species of *Scalpellum*, although mostly at other Stations, several places seem to be particularly attractive for species of the genus *Balanus*. Species of this genus were found at about 40 out of the 323 places or Stations, explored during the cruise of the Siboga. It happened no less than 8 times, however, that more than one species of *Balanus* was collected at the same place or with the same haul of the dredge. These cases were the following:

At Station 49[a]: *B. maldivensis* and *B. maculatus* n. sp.
At Station 50: *B. amaryllis* and *B. amphitrite.*
In Molo Strait (about Station 51) *B. ciliatus* n. sp. and *B. maldivensis.*
At Station 162: *B. amphitrite* and *B. socialis.*
At Station 164: *B. amphitrite*, *B. calceolus*, *B. cornutus* n. sp., *B. quadrivittatus*, *B. quinquevittatus* n. sp. and *B. socialis.*

At Station 204: *B. compressus* n. sp., and *B. proripiens* n. sp. At this Station two species of *Scalpellum* also were collected (See p. 56 of this report).
At Station 260: *B. albus* n. sp. *B. auricoma* n. sp., and *B. investitus* n. sp.
At Station 310: *B. investitus* n. sp., *B. maculatus* n. sp., and *B. maldivensis*.

All the species of *Balanus* were found in the neighbourhood of the coast. Several of them were caught in shallow water, some in rather deeper water, and only a few in water of greater depth than 100 m. The greatest depth found inhabited by a species of this genus was 564 m.; at depths of more than 600 m., at which 26 species of *Scalpellum* were collected, not a single species of *Balanus* was observed.

Several species seem to spread over a rather considerable range of depth: as for example *B. maldivensis*, which was observed at depths of 54—91 m., 70 m., 216 m., and even of 390 m., and *B. albus* at depths of 90 m., 289 m., and, probably, even at a depth of 522 m. The following table contains the species of *Balanus* collected during the cruise of the Siboga, arranged according to the depth at which they occurred:

B. tintinnabulum Linn. (in different varieties)	Surface.
B. amphitrite Darwin	Surface—56 m.
B. arcuatus n. sp.	9—36 m.
B. socialis Hoek	9—36 m.
B. bimae n. sp.	13—31 m.
B. amaryllis Darwin	13—40 m.
B. auricoma n. spec.	27 (and ? 90 m.)
B. calceolus Ellis	32 m.
B. cornutus n. sp.	32 m.
B. quadrivittatus Darwin.	32 m.
B. quinquevittatus n. sp.	32 m.
B. ciliatus n. sp.	34—113 m.
B. longirostrum n. sp.	36 m.
B. hystrix n. sp.	40 m. (or less)
B. navicula Darwin	45 m.
B. terebratus Darwin	52 m.
B. maldivensis Borradaile	54—390 m.
B. maculatus n. sp.	70—73 m.
B. investitus n. sp.	73—90 m.
B. proripiens n. sp.	75—94 m.
B. compressus n. sp.	75—112 m.
B. minutus n. sp.	80 m.
B. albus n. sp.	90—289 (and ? 522 m.)
B. pentacrini n. sp.	204—304 m.
B. tenuis Hoek	275 m.
B. alatus n. sp.	564 m.

A few remarks may be added with regard to the geographical distribution of these species of *Balanus*. That 16 species were collected, which were not observed before, does not prove, of course, that they do not occur outside the Malay Archipelago: the exploration of this region on this occasion has been a very careful one; therefore, it cannot be considered improbable, that at least some of these species will be found in other regions of Eastern Asia, should they be explored with the same care and thoroughness, as the Malay Archipelago has been. Of the species collected by H. M. S. "Siboga", which were already known, *B. amphitrite* and *B. tintinnabulum* seem to have the widest distribution, which no doubt is due partly to their being often found on ships-bottoms: they are sometimes associated with one another even on the same ship. *B. calceolus*, *B. navicula*, *B. amaryllis*, and *B. maldivensis* are known to occur in British India also, and *B. amaryllis* in Australia as well. *B. quadrivittatus*, *B. socialis*, and *B.*

tenuis were already known to inhabit the Malay Archipelago; they have not been observed outside that region so far I know. *B. terebratus* DARWIN was not known to occur in the Malay Archipelago: DARWIN reported, that the habitat of this species was unknown to him. In two recent papers (one [1] of BORRADAILE and one [2] of ANNANDALE) this species is mentioned, as probably occurring in the Maldive and Laccadive Archipelagoes and at Ceylon. This is, of course, by no means improbable; but as these specimens did not show the peculiar structure of the basis, which struck DARWIN and caused him to give the species its name and which is indeed very striking, some doubt remains whether the above-named authors really met with it.

There is, after all, to judge from our present knowledge, some reason to admit that the Malay Archipelago has its special fauna of species of *Balanus*. Of course this cannot be proved, since any species, which at present is known from that region only, may afterwards be found to occur outside it. And even the great number of species that have been observed in this region does not prove much in this respect. In this connection, I wish to point out also, before leaving the subject, that several species of *Balanus* have been observed in regions bordering on the Malay Archipelago, which seem to be absent in that region itself: namely *B. nigrescens* Lamarck from West-Australia, *B. cymbiformis* Darwin from Madras, *B. carenatus* Gruvel from Akyab (Burma), *B. allium* Darwin from Ceylon and Australia, *B. vestitus* Darwin and *B. imperator* Darwin from New South Wales, and *B. aeneas* Lanchester from Manaar. But here again the same must be kept in mind, namely that no matter how carefully a region may be explored, several species may still be found there which hitherto have escaped observation. In consequence of the difficulty of the determination, it is even possible that one or more of the species described as new in this report, may after all turn out to be identical with one of those described already. For example, my new *B. arcuatus* may be found to be the same as DARWIN's *B. allium*, as is explained by me in this report, where the description of my new species is given. The latest publications I have seen in which species of *Balanus* also were described, and which treat of the Cirripedes of East-Asia, are PAUL KRÜGER's paper (l. c.) which forms a part of DOFLEIN's contributions to the natural history of East India, and PILSBRY's paper on the Barnacles of Japan and Bering Sea. Both papers were published in the course of 1911. According to KRÜGER, *Balanus* is represented in East Asia by 13 species and in DOFLEIN's collections by 8, two of which only, viz. *B. tintinnabulum* and *B. amphitrite*, were collected also during the expedition of H. M. S. "Siboga", in the Malay Archipelago — but, as is well-known, and is said already (p. 153), these are both species with a world-wide distribution. Of the other six species of KRÜGER, one (*B. corolliformis*) may remain undiscussed here, it being one of those which I propose to include in a new genus; one (*B. trigonus*), which is represented by numerous samples collected in Japan waters, is, according to DARWIN, found also in the Malay Archipelago, and in Australia; three (*B. crenatus*, *B. rostratus* and *B. cariosus*) which were collected also in Japan, are species known hitherto from only temperate and colder

[1] BORRADAILE, l. c.

[2] ANNANDALE, N., On the Cirripedia (of the Gulf of Manaar). In HERDMAN's Report on the Pearl Oyster Fisheries, published by the Royal Society, 1906.

seas; finally one species (*B. poecilotheca*) remains, which is a new species, at present known from Japan only. Therefore the number of species occurring in the waters explored by DOFLEIN and in the Malay Archipelago at the same time, which really seem to correspond, is not very important. Neither is this the case with the species enumerated by PILSBRY for Japan and Bering Sea: he mentions four true species of *Balanus* together with a so-called subspecies (*B. rostratus*, *B. rostratus-apertus* Pilsbry (subspec.), *B. crenatus*, *B. cariosus*, and *B. Evermanni*), but none of these seem to occur in the Malay Archipelago.

The determination of a sample of Barnacles of the genus *Balanus* is often a difficult task, and is possible only if the material at hand is sufficiently rich to permit of a thorough investigation. This, however, is not very often the case with the samples of Barnacles collected with the dredge, this being a very haphazard method especially at great depths. Indeed several of the new species described in this report, are represented in the collection, submitted to me, by one or very few specimens only. With few exceptions, I could not at first go further than to say that the sample "probably" belonged to a certain species, and when I attempted to determine it more closely, I invariably found it necessary to consider the form as a new species. In such cases, I have endeavoured to describe it as fully as possible, and to give several accurate figures of itself and its parts, that it will be possible to recognize it readily, should it be collected again. I wish to add that, perhaps with a single exception, which I have already pointed out, I feel almost certain that the new species will be found to represent as many different forms. I think that it is only sufficient detail in description and illustration which gives us the right to introduce new species into science; unfortunately such detailed descriptions cannot often be given without destroying the specimen, and in those cases in which a new species is based on a single specimen, this should be avoided as carefully as possible.

A question of no smaller difficulty is that of the arrangement of the numerous species of this genus into a really natural system. I must confess, that in this respect my work has not given me sufficient satisfaction, this was not possible I think because so many typical previously described species were not represented in the collection submitted to me which, on the other hand, was found, to be rich in new species. The genus *Balanus* has a world-wide distribution, being found along the coasts of all the continents and islands of the different zones of the surface of the earth. It cannot be wondered at that the species inhabiting such a region as the Malay Archipelago form only a relatively small part of the total. For a careful study of the relations among the different species, even the material found in all the large Museums of Natural History of the world could hardly be judged rich enough. Therefore, what I have been able to do in this respect with the Siboga material, has been rather to criticise the existing system and to give some indications as to what I would consider a better classification of the species.

The material that DARWIN made use of for his classification of this and other genera of Cirripedia, came from all parts of the world, and although, as on good grounds can now be asserted,

numerous and even very interesting species were unknown in DARWIN's time, the collection he used was indeed to a high degree representative. Moreover, his knowledge of the subject was an extremely thorough one: with much better methods than were known in his time, some of the later workers may have been able to penetrate further into details of anatomy or embryology, but none of them have surpassed or even equalled him in sharpness of observation, and in acuteness of separating different forms and uniting what belonged together. It must have been extremely difficult for DARWIN to find out how the numerous species of *Balanus* were to be classified in natural groups; that these groups in the main are still used, nearly 60 years after the publication of DARWIN's Monograph, certainly proves that in several respects his classification was founded on a reasonable basis.

DARWIN, when separating the genus *Balanus* with its numerous species into sections, exclusively made use of the structure of the shell namely, the parietes, the radii, and the basis. The barnacles of his Section A have the parietes, basis, and radii permeated by pores; those of Section D have the parietes permeated, the basis and radii not permeated; those of Section F have the parietes and radii not permeated, the basis sometimes permeated, and sometimes not. His Section B embraces those species in which the basis and parietes are sometimes permeated and sometimes not, the radii not permeated, but with an elongated shell and a boat-shaped basis; and, finally, his Section E was instituted for those species which have a membranous basis. I put this classification in the form of a table, which may make the comparison easier:

I. Basis membranous (*Section E*)
II. Basis calcareous (Sections A, B, C, D and F)
  1. Shell elongated, basis boat-shaped (*Section B*)
  2. Shell not elongated, basis not boat-shaped (Sections A, C, D and F)
    a. Parietes not permeated (*Section F*)
    b. Parietes permeated (Sections A, C and D)
      α. Basis not permeated (*Section D*)
      β. Basis permeated (Sections A and C)
        * Radii not permeated (*Section C*)
        ** Radii permeated (*Section A*)

We see than, that to refer a species of the genus *Balanus* to one of these sections, a careful study of the structure of the different parts of the shell is necessary, but this structure was at the same time thought sufficient. Although DARWIN carefully investigated the structure of the animal's body, and especially the parts of the mouth and the cirri, he seems to have been impressed more by the general agreement of that structure in the different species, than by the differences shown. Of several and very interesting species (*B. declivis*, *B. navicula*, *B. terebratus* etc.) the animal's body was unknown to him, and this circumstance may have contributed to his not using these parts for purposes of classification. The fact is that in DARWIN's classification of the genus *Balanus* the division into sections rests on the structure of the shell,

and the distinction of the different species in each section primarily on the shape and structure of the opercular valves. And I think it is a fact also, that a comparative study of the known species, has shown that the structure of the animal's body can with advantage be used in dividing the said genus into such sections and for separating the species. In this connection, I think it is remarkable, that the structure of the anterior ramus of the 4th pair of cirri was pointed out by DARWIN, as an important character in separating *Acasta* from *Balanus*, and that later researches have shown that a similar structure occurs also in numerous species of the latter genus. Supposing he had known this peculiarity, DARWIN would certainly not have denied its value for subdividing this genus.

I will now, first of all, discuss a few species of *Balanus* for which new sections of the genus were proposed, as DARWIN's division seemed inadequate to include them. These cases I think after all, do not or not sufficiently prove the necessity for so doing.

The first instance is found in my own work. While studying the Cirripedia of the Challenger expedition, in 1882, I met with two species with a membranous basis, but which, by the absence of radii and by the structure of the animal's body, showed themselves to be quite different from the species of section E (to which section they in accordance with their membranous basis should belong), and also from any known species of the genus. I therefore thought there was good reason to propose a new section for the reception of these species. The Siboga material contains specimens of two new forms, which doubtless belong to the same group, and in the mean-time PILSBRY (1911) published descriptions of two other new species, which appear also to be closely related to the somewhat abnormal forms I described in the Challenger Cirripedia-report. On carefully going over the new material which came to hand however, I found, that there was sufficient reason to separate this whole group of species from the genus *Balanus* and to create for it a new genus. Therefore, my section G of *Balanus* is to be cancelled; for further particulars regarding the new genus I refer to what is to be found in the present report, when this new genus (*Hexelasma*) is described.

BORRADAILE (l. c.), in 1903, described a new species of *Balanus* (*B. maldivensis*), collected in S. Nilandu Atoll (Maldive Archipelago), and found its shell so peculiar, that it appeared to necessitate the founding for it of a new section of the genus. This had the following characters: "All parts of the shell present, heavy and without pores". The Siboga material, which contains this species also, gave me a good opportunity to study the form, and, as I will explain in further detail under the specific heading, made me doubt whether there was really sufficient reason for maintaining for it a new section. I think that its place is in DARWIN's section F, but there is on the other hand good reasons for subdividing that section.

In the same year (1903) GRUVEL (l. c.) proposed to establish a new section for a species from the Congo which he named *B. Dybowskyi*. He defined that new section as follows: "Parietes and basis with pores, no radii". I have never seen specimens of this species, so I only know it from the figures GRUVEL published in his "Monographie" of 1905. The chief character of the section is the absence of radii in GRUVEL's new species. Providing these are totally absent, then, I think we may ask if this species does really belong to the genus *Balanus*? We should not forget, however, that there are species in DARWIN's section F,

which have the radii narrow or absent (*B. flosculus*) or not developed at all (*B. vestitus*), and that DARWIN's section C contains also *B. perforatus*, which has the radii either not at all developed, or extremely, or only moderately narrow. GRUVEL's species might perhaps find a place in the latter section, which contains those species of *Balanus* which have the parietes and the basis permeated by pores, and the radii, if developed, not permeated.

Returning to the species represented in the collection brought home by H. M. S. "Siboga", I will not enter too much into details regarding my experience (and very great difficulties) in dividing the new species into the different sections of the genus. In several instances this was found to be quite impossible. But to go on as was done hitherto, and to create a new section for every species that did not enter so well into one of the sections previously proposed, seemed also unsatisfactory. The conclusion was that I adopted a somewhat new classification of the species of this genus, but without departing more than necessary from the original division as proposed by DARWIN. I think this classification must speak for itself. I only wish to add that as I was obliged to include some of the known species in other sections, and as the limits of these sections had to undergo some changes in consequence, and a few other sections were to be introduced and a few of the old ones to be cancelled, I have thought it better, to avoid confusion, to designate these sections in future with special names, as I did with those of the genus *Scalpellum*, instead of using the characters A, B, C, etc. as was done by DARWIN.

The sections I wish to propose are the following:

Section *Mega-Balanus* (corresponding with DARWIN's section A) is so-called, because it contains the largest forms of existing Balani. This section is represented in the Siboga-material by one well-known species only, so I have nothing to remark with regard to it.

Section *Ortho-Balanus* is a combination of DARWIN's Sections C and D; it contains Balani having the parietes permeated by pores, the basis sometimes permeated and sometimes not permeated, and the radii not permeated. Numerous species (DARWIN knew 14 living species) belong to this Section, which, however, in the Siboga collection is represented by few species only: *B. amphitrite* Darwin in different varieties, *B. alatus* n. sp. from a depth of over 500 m., and *B. minutus* from 80 m. To this section belongs *B. trigonus* Darwin, the third cirrus of which, according to KRÜGER, is furnished with curious thorns ("merkwürdige Dornen") along the anterior face[1]) of the segments. These curved hook-like teeth, as DARWIN called them and which he thought were peculiar to *Acasta*, are present also on the third cirrus of *B. amphitrite*, *B. alatus*, and *B. minutus*. None of the species of DARWIN's Section D are found in the Siboga-collection. I venture to propose to include it with Section C in my Section *Ortho-Balanus*, being of the opinion that the porosity or non-porosity of the basis is not of sufficient importance for separating these two sections. As DARWIN pointed out himself, some species of Section C (*B. improvisus*, *B. nubilus* of the living species) have the basis imperfectly porose, whereas a species of Section D (*B. patellaris*) has the basis "sometimes permeated by imperfect pores".

[1] KRÜGER also compares them — and of course he is right there — with the spines observed in *Acasta*; I do not quite understand, however, how he can say that they are found on the dorsal side („auf der Rückseite") of the segments. They are in all the species on the inner, anterior face of the segments.

For subdividing this section other reasous may be found later, I feel unable with the material at hand, to make a proposal in that direction.

Section *Striato-Balanus*. This section contains species that have no pores in the the parietes and radii (which belonged to DARWIN's Section F or might have been considered to belong to it). They show the common features of having the scutum striated longitudinally, and of having, as a rule, narrow radii. These species — *B. amaryllis* Darwin, *B. albus* n. sp., *B. bimae* n. sp., *B. maculatus* n. sp. — seem to form a very natural group. Several species belonging to it are of somewhat larger size. Whether *B. Hameri* Ascanius is to be placed in this section or into the next is difficult to say: it has the scutum feebly striated longitudinally, but its radii are not so narrow as is the case in the more typical species. *Balanus vestitus* Darwin, *B. imperator* Darwin, and *B. flosculus* Darwin have narrow radii also (they are even absent in *B. flosculus*) and might also be included in this section; they do not show, however, the characteristic feature of having the scutum striated.

Section *Solido-Balanus*. This section contains species which have the parietes, radii and scutum smooth, as a rule rather thick, the parietes and radii, moreover, without pores. They have also a solid basis, with crests running over the surface, or with narrow canals radiating from the circumference. The radii are rather broad and most of the species seem to be of small dimensions only. *B. socialis* Hoek, and *B. maldivensis* Borradaile belong to this section, which, embraces *B. auricoma* n. sp., *B. ciliatus* n. sp., and *B. compressus* n. sp., of the material collected by the "Siboga".

Section *Membrano-Balanus* corresponds to DARWIN's Section E and contains the species with a membranous basis. I am in doubt whether this is really a good section, that is, a natural group of species: like DARWIN himself I do not feel sure that the species really belong together. That the basis is membranous, or is non-calcareous, is a negative character only. But as only one species of the Siboga-material belongs to it, and is, moreover, a somewhat abnormal form, I had better not enter into discussion about this question. The new Siboga-species is *B. longirostrum*, which is nearly related to *B. declivis* Darwin; it has non-porose parietes and lives embedded in sponges. Numerous segments of both rami of the fourth cirrus, are, in this species, armed with transverse groups of triangular teeth, such teeth occurring also, but smaller, on most of the segments of the 2nd and 3rd cirri. This shows, perhaps, that the species is allied to some of the species of the Section *Armato-Balanus*.

Section *Armato-Balanus*. The species of this section have as a rule the parietes and radii without pores; some of its species, which were already known and which I propose to include in it, were considered by DARWIN to belong to Section F. This section emerges into the genus *Acasta*[1] by some of the segments of the anterior ramus of the 4th cirrus being armed with rows of teeth, and it is at the same time nearly related to the section

[1] DARWIN has pointed out already that some of the species of his Section F (*B. terebratus*, *B. allium*, *B. quadrivittatus*) can hardly be separated naturally from the genus *Acasta*. It is certainly very interesting that DARWIN's main reason for separating them — viz. the structure of the 4th cirrus in *Acasta* — has now been found not to exist: the structure of that cirrus in these species corresponds exactly with that of some species of *Acasta*.

Patella-Balanus: as we shall see, *B. proripiens* of that section has also small teeth on some of the segments of the 4th cirrus. Three of the new species collected by H. M. S. "Siboga" are placed in this section: *B. arcuatus*, *B. quinquevittatus*, and *B. hystrix*. The last named has the parietes permeated by pores; therefore by this species this section passes into the Section *Ortho-Balanus*, which, as it is here proposed, would correspond with DARWIN's Sections C and D.

Section *Patella-Balanus*. This section corresponds with DARWIN's Section B. It is represented in the Siboga-material by five species, two of which were known to DARWIN (*B. calceolus* Ellis, and *B. navicula* Darwin). The remaining three (*B. cornutus*, *B. investitus*, and *B. proripiens*) are new. The elongated shell and the boat-shaped basis form the main features to recognize the species of this section and which no doubt constitutes a very natural group. This section is nearly related to the foregoing section *Armato-Balanus*, in different respects, as also by the circumstance that some species have small teeth along the inner face of some of the segments of the third cirrus. In one of the species (*B. proripiens*) these are also observed on some of the segments of the fourth cirrus.

Section *Bathy-Balanus*. It is for a single, yet well-defined species, that I feel obliged to create this section, namely *B. pentacrini* n. sp. from 200 to 300 m. It has the parietes, radii, and basis without pores and therefore would belong to DARWIN's Section F, but, I think, it should form a section by itself, since it has the labrum without a notch, a small and shallow excavation indicating the place the notch occupies in the other species. Having well-developed radii and a calcareous basis, there is no reason to doubt its belonging to the genus *Balanus*. On the other hand it cannot be denied that it corresponds in the structure of its labrum to the species of my new genus *Hexelasma*: it can be considered as forming the transition from the genus *Balanus* to that of *Hexelasma*.

As will be easily understood, the classification here proposed aims only at bringing together in natural groups those forms or species which I think really belong together. It is not my opinion that the arrangement is a final one, and it is only with great reserve that I venture to propose putting it in the place of DARWIN's classification of 1854. And especially so, since I am not entirely satisfied that it will be possible to include all the species known at present, in the sections or divisions as they are here proposed. Yet DARWIN's sections must be revised in certain respects, and the sections added to the genus by later authors cannot be accepted. Several of the new species described since the publication of DARWIN's Monograph claim a place in the system, although they do not enter so well into one of the old sections. Therefore an attempt to improve the classification was I think fairly justified. If the one here proposed does not prove to be a good one, it need not be maintained — it may, however, turn out to be of use, at least in some respects, to a future monographer of the genus. The genus certainly needs to be thoroughly dealt with by a good specialist! He should, however, not begin his task before he has succeeded in bringing together sufficiently rich material of the existing species, and that in a good state of preservation — and he must not expect that his task will be a light one.

As has already been said, I propose to make use of the structure of the 3rd and 4th pairs of the cirri for the classification of the species of the genus *Balanus*. I think that FRITZ MÜLLER was the first to observe that such claw-like spines occurred on the cirri of a species of the genus *Balanus* (*B. armatus*): according to him, they are in that species strongly developed on the segments of the 3rd, and on the posterior ramus of the 4th pair, but, in less developed condition, on some segments of the 5th and 6th cirrus also. On the same occasion he recorded the presence of such spines on the cirri of other species of *Balanus*, of which he gave *B. improvisus*, var. *assimilis* as an example. Recently (1911), KRÜGER pointed out a similar peculiarity in the cirrus of the 3rd pair of *B. trigonus* Darwin, and in the mean time, the study of the species of *Balanus* collected by the Siboga has shown that such armature is a common feature of several other species of this genus. In some species it is the 3rd cirrus only which is armed, in others it is the fourth, and there are also species in which both cirri and sometimes the 2nd or the 5th also are furnished with these claw-like teeth. In other respects these species differ more or less considerably from one another, and so it has not been possible to include all of them in the same section of the genus *Balanus*. For, while some of these (*B. amphitrite* for an example) in every respect are true Balani, it cannot be denied that some of these species with armed cirri show resemblance to species of *Acasta*. Yet even the latter species, when we take all their characteristic features together, cannot be separated from *Balanus*. They must therefore remain in that genus but at the same time may be considered as forming the link between that genus and *Acasta*.

Besides the fact that it is not always the same cirrus (or cirri) which shows (or show) the armature, another difference must be pointed out with regard to the shape of the teeth themselves. They are of two different types: on the cirrus or cirri of some species they appear like small triangular spines, which are attached to the surface of the segment with a rather broad basis and, as a rule, at some distance from each other. The surface of attachment can distinctly be made out as a small place of oval shape, exactly as is the case with other spines, or hairs, which, as a rule, have a rounded surface of attachment. The other type consists of teeth, which are like little hooks slightly curved downwards, or (seldom) upwards, and form so many chitinous excrescences along the margin, which often stands off like a list or rim on the surface of the segment. These teeth are close together, and form a saw-like structure. Transitions from teeth of the one type to the other are, however, not infrequent.

I give here a list of the species of *Balanus* which I found furnished with armed cirri and which belong to the collection made by H. M. S. "Siboga":

Section *Ortho-Balanus*

B. amphitrite: 3rd cirrus, both rami with a row of downward-curving teeth along anterior face of numerous segments. One or more parallel rows of smaller teeth on the surface of the segments.

4th cirrus, both rami have a group of smaller teeth on each of the 12 lower segments.

B. alatus: 3rd cirrus, the longer ramus with a few teeth between the hairs near the extremity

along the anterior face of several segments; similar but smaller teeth, are also observed on a few segments of the shorter ramus.

B. minutus: 3rd cirrus, both rami with a few (2—3) very small teeth on the middle segments.

Section *Solido-Balanus*

B. ciliatus: 3rd cirrus, both rami with rows of recurved teeth along the anterior face of the segments; the last segment of the longer ramus, and the last three segments of the shorter excepted.

4th cirrus, anterior ramus, 2nd to 6th segment with small recurved teeth.

B. compressus: 3rd cirrus, both rami, numerous segments near anterior face, and upper extremity armed with groups of triangular and straight teeth.

Section *Membrano-Balanus*

B. longirostrum: 2nd cirrus, both rami, nearly all the segments armed near extremity with transverse rows of small triangular teeth.

3rd cirrus, both rami, as on second cirrus, but teeth slightly stronger.

4th cirrus, both rami with well-developed transverse rows along upper margin of most segments, and also of the two segments of the pedicel.

Section *Armato-Balanus*

B. arcuatus: 3rd cirrus, both rami, row of recurved teeth along nearly all the segments.

4th cirrus, with a few teeth along the anterior margin of some of the segments of the shorter ramus only.

B. terebratus: 3rd cirrus, longer ramus has a few small teeth along the lower segments.

4th cirrus, shorter ramus has a row of recurved teeth along anterior face of the lower segments.

B. quadrivittatus: 3rd cirrus, anterior ramus, on the segments 2—7, near the extremity, a row of extremely small teeth is disposed.

4th cirrus, second segment of pedicel, and lower segments of anterior ramus with a row of sharp recurved teeth.

B. quinquevittatus: as *quadrivittatus*, but spines on 3rd cirrus still smaller and the teeth along 2nd segment of pedicel of 4th cirrus forming a much longer row.

B. hystrix: 3rd cirrus, both rami, numerous rows of recurved teeth all over the surface, the strongest along the anterior margin of nearly all the segments.

4th cirrus, both rami, teeth along the anterior face and on the surface of numerous segments.

5th cirrus, both rami, teeth along anterior face and on surface of numerous segments.

Section *Patella-Balanus*

B. cornutus: 3rd cirrus, both rami have a row of small thorns or teeth along inner face of all the segments, with the exception of the last.

B. proripiens: 3rd cirrus, longer ramus has a group of 2—4 short strong teeth near anterior face, and upper extremity of all the segments.

4th cirrus, shorter ramus has the 5 to 6 lower segments armed with a group of from 2 to 4 small teeth.

Finally, a remark regarding the relations between the fossil and recent forms, and another regarding the species living at different depths, may find a place here.

DARWIN[1] states that *Balanus* is the oldest genus of the Balanidae yet known; according to him, the extinct forms of the genus belong to the section that has the parietes not permeated by pores. He therefore seems to admit, that the oldest species were those that have no pores. Consequently, the fact that the oldest-known species — *B. unguiformis* from the Eocene — had the parietes almost as often as not permeated by pores is considered by DARWIN as presenting to the systematist a most unfortunate peculiarity. However, when we consider that of the ten other fossil British species, which DARWIN described, 6 have the walls permeated, and 4 have no pores in the walls, we may certainly ask whether this character has really the importance DARWIN gives it. It may be true, that of these four species, three (*B. bisulcatus*, *B. dolosus*, and *B. inclusus*) are extinct forms, whereas all the other fossil species he describes are also found living. But this, I think, does not prove that these three species are really older or more primitive forms. The forms still existing are found along with the extinct ones throughout the same tertiary stages: special circumstances, which we need not consider here, may have caused the equally old or even older species to remain, and others as old or possibly not so old to become extinct. The fact that the oldest-known species of *Balanus* (*B. unguiformis*), sometimes has the parietes permeated by pores, goes far to prove that the permeated condition of the walls is as old as the genus itself.

In this connection it is interesting to observe that the species which inhabit deeper water have the walls as a rule thin, seldom thick or heavy, and sometimes longitudinally ribbed on the internal surface, sometimes not, but almost always solid, and without pores. At very considerable depths, no species of this genus seem to occur, but those found in rather deep water must, I think, be regarded as younger forms which have developed from shallow water species. It even seems possible, in some instances, to point out the shallow water species from which a form of the deeper sea may have developed: in such a case it may be a species with permeated parietes from which another with solid walls may have descended. The species living at greater depth do not want such strong shells as those that are continually exposed to the rolling waves near the coast; so the permeated condition of the walls, which is an ideal structure as regards strength and economy in the use of shelly matter, and which has its highest development in numerous true coastal forms, may have been lost by a series of forms gradually wandering into deeper water. I need hardly add that, according to my opinion, there is no reason to consider the species from deeper water as representing more primitive forms. On the other hand, species with solid walls are also observed in shallow water and, of

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[1] DARWIN, CH., A Monograph on the fossil Balanidae and Verrucidae of Great Britain. London. 1854. p. 5.

course, species in deeper water may as well have developed from such forms: the species of *Balanus* occurring in deeper water (see the table p. 153) do not belong to one and the same section and, probably, had a very different descent.

1. Sectio: **Mega-Balanus**

1. *Balanus tintinnabulum* (Linn.).

DARWIN, CH., Monograph. Balanidae and Verrucidae. 1854, p. 194, pl. I. fig. *a—l*, pl. II, fig. 1*a*—1*o*.

This species is represented by one sample only: a few specimens, which were found attached to the bottom of H. M. S. "Siboga", when the ship was docked on October 15th, 1899. The ship had been previously docked and cleaned on June 1st, of the same year: so the Balani, probably, developed in the period between the two dates.

The sample is composed of four specimens that caused me great trouble. One of the specimens can be determined at once as belonging to DARWIN's variety (3) *validus*; but the remaining three represent two forms, not only different from the first, but also different from all the varieties (11 in all) described by DARWIN. Therefore the case mentioned by DARWIN in which three most distinct varieties were taken from the bottom of the same vessel, is here repeated. The three specimens are relatively small, and I do not feel sure, therefore, that they are full-grown animals. Their form — of one especially — is so characteristic, that I really prefer to describe them as different varieties.

a. *B. tintinnabulum*, var. *validus* Darwin.

The specimen looks exactly like the figure (Pl. I, fig. *c*) given in DARWIN's Monograph. The coarsest and strongest specimens that DARWIN saw, were said to have been attached to a surface of iron: this holds good also for the one taken from the surface of the "Siboga"; parts of the outer surface of the basis are coloured red, from the ship's being painted with red-lead.

The shape of the shell is conical, slightly convex at the rostral side; it is coarsely ribbed, with some of the ribs flexuous and most of them rugged; the orifice is relatively large, rounded, angular, but at the rostral and carinal extremities, the basis is partly lost, the remaining part is flat and the whole must have measured 29 and 20 mm. in diameter. The tergum corresponds almost exactly to the figure given by DARWIN for his variety *communis*: it has a well-developed longitudinal furrow, which is quite closed, a prominent articular ridge, extending over three fourths of the length of the valve, the spur is produced for a considerable distance up the internal surface of the valve, the crests for the depressor muscle are only feebly developed. The scutum has rather prominent lines of growth, the general shape resembling that of DARWIN's var. *coccopoma*. The articular ridge is broad, much reflexed and slightly hooked at its base, it extends over half the length of the valve. The adductor ridge is well-developed and the cavity for the lateral depressor muscle rather deep.

DARWIN did not say where his specimens of this variety were collected. We now know for certain that it occurs in the Malay Archipelago.

b. *Balanus tintinnabulum*, var. *costatus* nov. var. Pl. XIV, fig. 5 and 6.

This form is represented by a fine specimen with very prominent ribs, the basal extremities of which extend beyond the elongated, rounded circumference of the basis. I do not know, of course, whether its shape would undergo changes during growth, and if so, what changes they would be — for the present I think it best to describe it as a distinct variety.

The shell has a very regular shape, flatly conical, with a large rhombiform orifice and triangular radii, the upper margin of which runs nearly parallel to the basis. The surface is distinctly ribbed, much stronger ribs alternating with groups of smaller and narrower ones. The radii are feebly striated in horizontal direction, the striae representing the very delicate canals which traverse them. The parietes as well as the basis have distinct pores. The outer surface of the ribs is white, the furrows between them being coloured pink or red, with here and there small spots coloured darker red. The greatest diameter of the basis is nearly 14 mm., the shortest not quite 10 mm.

The scutum (Pl. XIV, fig. 6*b* and *c*) has the broad and reflexed articular ridge like the other forms of this species, and the tergum looks very much like that of a typical *B. tintinnabulum*, its furrow being open, however, as is usual in young specimens. The spur is broad and flat, and cannot be said to be distinctly produced at the internal surface of the valve (Pl. XIV, fig. 6*a* and *d*): differences which, probably, will change when the animal grows older.

c. *B. tintinnabulum*, var. *plicatus* nov. var. Pl. XIV, fig. 7.

Two specimens of this new variety were collected along with the foregoing. They are, probably, young specimens. The smaller is attached to the larger and, perhaps, slightly older one.

The shape is conical, but the circumference of the basis is smaller, that of the orifice relatively larger, the whole shell, in consequence, more steep than the case is with the var. *costatus*. Corresponding ribs are present, but the stronger ones are by no means so prominent; their basal extremities hardly extend beyond the circumference of the basis. So this circumference is nearly circular, the extremities of the ribs forming small round festoons only round that circumference. The surface of the ribs, of the deeper furrows, and of the spots here and there along the margins of the valves, are coloured in the same way, though perhaps not quite so distinctly, as in the variety *costatus*. The size of the basis is about 10 mm. in diameter.

The shape of the opercular valves generally corresponds to that of the var. *costatus*. Both forms have the lines of growth on the scutum more prominent, than, according to Darwin's description, one might expect them; these lines of growth are slightly sinuous; their crests — especially those near the basal margin — are furnished moreover with a row of minute points, and consequently are slightly crenated. The tergum has the furrow open and relatively broad; the spur as a whole is, however, not quite so broad as in the variety *costatus*, its extremity is slightly more rounded. The crests for the tergal depressor muscle are, in this variety, not quite so strong as in the var. *costatus*.

This description applies to the larger of the two specimens. The smaller specimen, which is attached to the side of the larger one, (see fig. 7) no doubt belongs to the same form or variety.

For a study of the body included within the shell I used that of the specimen of the variety *validus*.

Mouth. Labrum: Crest divided by the notch into two nearly quadrangular parts with rounded edges; notch deep, with entrance widened; 3 small and blunt teeth, one of which only is distinct, on each side of notch; between the teeth and along the whole crest and entrance of notch microscopic hairs are disposed. The thickened sub-triangular shield, the whole of which may be considered as the chitinous labrum, terminates interiorly into a distinctly rounded off and on both sides broadened manubrium (Pl. XIII, fig. 16).

Palpi: Shape elongately oval, large, free extremity rounded. Upper margin nearly straight, under margin rounded. Internal surface produced to a well-developed crest which runs, when the palpi are in a downward position, parallel to the crest of the labrum. The upper margin is thickly clothed with short hairs, the under margin is quite hairless. On the external surface a conspicuous and very characteristic row of about 10 longer hairs is disposed, the row making an angle with the under margin. Towards the free extremity of the palpus this row is continued by a few longer hairs disposed along that extremity. For the rest the external surface bears a group of longer hairs near the outer extremity only. On the contrary, the internal surface bears a dense clothing of short and somewhat curling hairs over a large part of the upper half, which are longer along the crest running parallel to the upper margin: these latter hairs overhang the crest of the labrum (Pl. XIII, fig. 16 and 16′).

Mandible: 5 teeth and the inferior angle; the latter small, bifid. The 2nd and 3rd teeth are indistinctly double; the distance between the extremities of the 2nd and 3rd teeth about a fourth smaller than that between the extremities of teeth 1 and 2. The lower part of the mandible is well-developed; its surface, near the outer edge, is covered with numerous hairs, a few of which are seen along the upper margin. The inferior margin, from the extremity to more than one half, is covered by a dense row of rather stiff hairs (Pl. XIII, fig. 17).

Maxilla: The free edge is nearly straight, with a trace only of a notch under the upper pair of slightly larger spines. The length of the under large pair of spines slightly exceeds that of the upper pair. Number of spines between the upper and lower pair at least seven, six of which are disposed in a double row (3 pairs), one standing alone. The upper margin is strongly curved, the part near the free edge, however, is straight and runs parallel to the under margin. The apodeme is well-developed, its length corresponds to about that of the maxilla, measured from the tip of the triangular innermost part to the free extremity of the spines disposed along the edge (Pl. XIII, fig. 18).

Outer Maxillae: Outer lobe oval, slightly narrower towards free extremity, inner lobe represented by a semi-circular swelling on the inner and inferior half. The hairs, of which the longest are feathered or doubly serrated, as Darwin says, cover a large part of inner surface of outer lobe, but they are more densely disposed near the free extremity. A

single row of hairs is situated parallel to the inner margin, between the denser tuft of hairs of the extremity and the inner lobe. The inner lobe bears numerous long hairs on the semi-circular innermost half; these hairs are distinctly feathered and are directed inwards and downwards. The surface of the rest of the inner lobe shows numerous circular pits, looking like so many places where hairs might have been disposed (Pl. XIII, fig. 19).

Cirri. First pair: rami unequal, but not very strongly; the longer ramus has 17, the shorter 13 segments. The shape of the segments may be seen in the figure. The six or seven lower segments of the shorter ramus are distinctly protuberant on their inner face, the pigmentation of the outer half of the segments extending over the protuberances (Pl. XIV, fig. 1).

Second pair has the rami slightly unequal, the longer with 14, the shorter with 13 segments; the whole cirrus is a little shorter than that of the first pair. The inner faces of the segments of the longer ramus more protuberant than those of the shorter ramus. The protuberances of the segments of the longer ramus are furnished with very conspicuous and dense tufts of hairs (Pl. XIV, fig. 2).

Third pair has the rami also slightly unequal, of 13 and 12 segments respectively. The rami are more robust, but hardly longer than those of the first pair. The inner faces of the segments of the longer ramus are more protuberant than those of the other ramus. The tufts of hairs disposed on the protuberances not so strongly developed as is the case on the second cirrus. The projecting membranous plate fringed with fine bristles, which, according to DARWIN, is found on the thorax, on either side at the bases of third pair of cirri, was found well-developed in the specimen investigated (Pl. XIV, fig. 3 *a*).

Fourth-sixth pairs equal in length and in number of segments. This number was found to be 29 — and to vary between 28 and 30. The shape of the segments, in general, is quadrate, the middle and lower segments being, however, broader than long, the outer segments about as broad as long. The segments (Pl. XIV, fig. 4) are slightly shield-shaped in front, and bear only two pairs of longer spines: these are wanting on five or six of the lower, and also on the last five segments of each ramus. Between the pairs of longer spines a group of delicate hairs or spines is regularly observed. The hairs or bristles disposed on the posterior side of the segments near the extremity are short.

Penis. Relatively short, cylindrical, distinctly ringed, tapering towards the extremity. Short hairs are scattered over its surface on the distal half, somewhat longer hairs being disposed near its extremity.

As I said already p. 164, the different forms or varieties of this species described here were taken at the same time from the bottom of the "Siboga" when the ship was in the dock, October 1899. As is well-known this species is common in all the warmer seas of the world.

2. Sectio: **Ortho-Balanus**

2. *Balanus amphitrite*, Darwin. Pl. XIV, fig. 8—17.

DARWIN, CH., Monograph. Balanidae and Verrucidae. 1854, p. 240, pl. 5, fig. *2a—2o*.

This species was collected by H. M. S. "Siboga" at half a dozen Stations and at depths

varying from 13 to 56 m. The specimens, even those from the same station, often show considerable differences in colour; most of the specimens are small, and some of them at least may not be full-grown. I think it will be best to give short descriptions of the different sets.

I. Stat. 2. March 8, 1899. Lat. 7° 25′ S., Long. 113° 16′ E. Depth 56 m. Bottom: grey mud with some Radiolaria. Madura-strait. Half a dozen specimens attached to the shell of a Gastropodous mollusc.

Small specimens: greatest diameter of the basis of the largest specimen 5 mm., shell conical, greatest diameter of orifice 2.5 mm. Radii not very broad, with the summits very oblique. Colour dirty white, with reddish tinted longitudinal bands crossed by greyish horizontal stripes. Radii with distinctly reddish horizontal stripes on a lighter underground.

The scutum has prominent growth-ridges, finely and not very distinctly beaded. The adductor ridge is not very strongly developed.

The tergum has a moderately broad spur with a longitudinal depression, not a deep furrow. The two portions of the basal margin, on the opposite sides of the spur, lie in a nearly straight line. Basi-scutal angle sharp, spur scarcely extending beyond the basal margin, and the extremity not sharply pointed. Internally the articular ridge is prominent; the crests for the depressor muscles only feebly developed.

This set corresponds in several characters to DARWIN's var. (1) *communis*.

II. Stat. 50. April 16/18, 1899. Bay of Badjo, West coast of Flores. Depth up to 40 m. Bottom: mud, sand and shells, according to locality. Numerous (about 25) specimens.

Middle-sized specimens: attached to small sticks or stems, and therefore laterally flattened with the basis elongated, narrow, and excavated. Longest diameter of one of the larger specimens near the basis, 8 mm. Colour from nearly white to dark purple, the colour being mostly in longitudinal stripes and in dark patches, arranged in horizontal lines crossing the longitudinal ones. Orifice large, rhombiform, toothed. Radii with the summits never quite parallel to the basis, but slightly or strongly oblique, often somewhat excavated. The colour of the radii is often darker than that of the compartments, and in several specimens even dark purplish; always distinctly horizontally striped.

The scutum with the lines of growth developed into distinct ridges, showing, though not very distinctly, microscopical beads at the surface. Adductor ridge long, but not very prominent.

The tergum has the spur broad and the longitudinal furrow indicated by a very shallow depression only; extremity of the spur rounded; crests for the depressor muscles very distinct. Growth-ridges well-developed and beaded like those of the scutum.

This set shows some resemblance to DARWIN's var. (9) *cirratus*, but I think it best not to identify it with the same.

III*a*. Stat. 71. Makassar and surroundings. May 10—June 7, 1899. Depth 27—32 m.

Three specimens of very characteristic shape, only one of which, however, is complete: the second is an empty shell without the opercular valves, and the third is represented by a

broken shell. All the three specimens are strongly flattened laterally, of conical shape, and the basis strongly curved round the narrow sticks to which they are attached. The orifice is medium-sized and distinctly toothed. They are beautifully coloured light red, and striped and spotted with darker red. The radii are either quite white (those of the rostrum) or darker, shading into darkish purple; their summits are oblique.

Greatest diameter of the largest specimen, near the basis, 11.5 mm.

III*b*. Stat. Makassar, May—June 1899, Depth 27—32 m. (Place and bottom not further indicated).

Half a dozen beautifully coloured specimens, attached to pieces of corals and shells. The colours are from light rose-red to purple in horizontal and in longitudinal stripes or patches. Radii often white, in a few specimens red or even purple, summits slightly oblique. Orifice of the shell large, elongately pentagonal, entire or indistinctly toothed. General shape of shell cylindrical rather than conical. Largest diameter of the biggest specimen, near the basis, about 11 mm.

The scutum has the lines of growth not very prominent, and no beads along them. Articular ridge very prominent, adductor ridge long, not very prominent.

The tergum has the spur broad and rounded at the extremity. Growth-ridges not prominent; crests for the depressor muscles of unequal length and not prominent.

III*c*. Stat. Makassar, May—June 1899 (Place, depth and bottom not further indicated).

A few larger specimens, greatest diameter of basis 14 mm., and several smaller ones, all attached to shells of Gastropodous molluscs. Colour greyish-brown, with slightly darker longitudinal bands. Shell conical. Orifice entire, in the smaller specimens superficially toothed, rhombiform, with the rostral extremity rounded, and the carinal pointed. Radii with their summits oblique.

The scutum has narrow but rather prominent lines of growth, which are beaded in an extremely delicate way, and which give the outer surface, when seen with a strong lens, a longitudinally striated appearance. Adductor ridge very prominent.

The tergum has the spur broad and rounded at the extremity. The longitudinal furrow forms a shallow excavation, which is nearly as broad as the spur and terminates in a point towards the apex. Crests for the depressor muscles moderately prominent. Carinal half of basal margin nearly straight.

IV. Stat. 109. July 5/6 1899. Anchorage of Pulu Tongkil, Sulu-archipelago. Depth 13 m. Lithothamnium bottom.

One small specimen, beautifully striped-red on a somewhat lighter ground, the stripes running horizontally and longitudinally, and crossing each other. Radii triangular with oblique summits, uniformly coloured red. Shell irregularly developed on a somewhat narrower basis. Orifice moderately large, toothed. Two very small specimens were taken at the same place, and probably belong to the same variety.

This form probably corresponds to DARWIN's var. (7) *obscurus*.

V. Stat. 162. August 18, 1899. Between Loslos and Broken-islands, at the Westcoast of Salawatti. Bottom coarse and fine sand with clay and shells. Depth 18 m.

Numerous smaller and somewhat larger specimens attached to the shells of a species of *Avicula* (?), or small stems of doubtful nature. Several specimens are crowded together and attached to one another. They are mostly small specimens, the larger ones having a basis the length of which does not exceed 6 mm. They are more cubic than conical, the orifice being large and not distinctly toothed. Some of the specimens have the surface covered with Bryozoa (a *Flustra*-like species), others with a thick coat of a white felt of a nature quite unknown to me. The colour is different even in specimens attached to the same shell or stem: white, pale red, or darker, as a rule with longitudinal stripes of a somewhat darker colour, very often crossed by horizontal lines of darker reddish spots. The radii are coloured white, or pale reddish or darkish-purple; their summits are oblique.

Scutum with rather indistinct growth-ridges, and the adductor ridge only very feebly-developed.

Tergum with the spur broad and short and the extremity pointed, though not acutely. The crests for the depressor muscles not prominent and, on the outer surface, hardly a trace of a longitudinal furrow.

This variety in many respects corresponds to that from III *b*, Station Makassar. They probably do not differ much from DARWIN's var. (8) *variegatus*. Yet in the Siboga-specimens, the shell cannot be said to be conical, nor the walls very thin; and as the resemblance to the forms from various other localities is great, I prefer to group them and to consider them as a new variety.

VI. Stat. 164. August 20, 1899. Lat. 1° 42'.5 S. Long. 130° 47'.5 E.; Depth 32 m. Bottom sand, small stones and shells.

About two dozen specimens, some attached to the shell of *Avicula* (?), some to small stems of a different nature. Numerous specimens are totally covered by a species of a Polyzoon (somewhat like *Flustra*). The specimens attached to the stems are flattened laterally, and surround the stem with their strongly curved basis. The longest diameter of one of the largest specimens is about 1 cm. The colours of the various specimens are very different, like in those from III *b*, Makassar and V, Station 162. In some of the specimens the shell is more cylindrical with large orifice, in others more conical. Walls apparently robust rather than thin.

Scutum with the growth-ridges not prominent, and hardly a trace of beads or longitudinal striae. Adductor ridge long and well-developed.

Tergum with the extremity of the spur obtusely pointed or rounded off. Longitudinal furrow indicated. Crests for depressor muscles rather prominent.

These specimens in the main correspond to those from Station 162, and those from Makassar.

VII. Stat. 273. December 23/26, 1899. Anchorage of Pulu Jedan, East coast of Aru-Islands (Pearlbanks). Depth 13 m., Bottom sand and shells.

The specimens are attached to small sticks, to one another, and to the shell of an

Avicula (?); the last are beautifully coloured, with longitudinal and horizontal stripes of lighter or darker red, with white or somewhat darker interspaces. The radii with their oblique summits are, in almost all the specimens, of a dark purple. The group of specimens attached to a small stem is of a duller colour, brownish, spotted with darker longitudinal and horizontal stripes. The radii in some of these specimens are also dark-coloured. All the specimens are small-sized, the largest diameter of the basis measuring at the most 8 mm.

Scutum with the growth-ridges not very prominent, and no beads along them; the adductor ridge in some of the specimens is well-developed, in others much less.

Tergum with the spur broad and rounded at the extremity. The part of the basal margin between the spur and the basi-scutal angle very short. Crests for the depressor muscles not much developed.

These specimens also show great resemblance to those of Stations 162 and 164.

VIII. Merauke (South coast of New Guinea). "Dr. KOCH coll. 1904".

Numerous dry specimens attached to a piece of wood, which to a large extent is destroyed by the holes of a species of *Teredo*. The shells are (in dry condition) white, have a conical, or, where they stand close together, cylindrical shape, and a rather large rhombiform orifice. The radii are not very broad and have their summits oblique and rounded. The diameter of the largest specimen near the basis is 13 mm., but most specimens are much smaller. These specimens give one the impression of being very strong.

The scutum has the growth-ridges not very prominent, the articular ridge half as long as the tergal margin, and the adductor ridge well-developed. There is a shallow triangular pit for the lateral depressor muscle.

The tergum has a narrow and rather long spur; that part of the basal margin which lies between the spur and the basi-scutal angle is long. The crests for the depressor muscles are moderately developed.

IX. Batavia. Upon bambusa from Sero. "Dr. VAN KAMPEN misit 1908".

Numerous specimens, most of them white, with pale or dark violet or bluish-grey coloured longitudinal stripes, crossed by lighter horizontal bands. Shell strong, flat conical with the radii narrow and their summits very oblique, coloured greyish, with delicate slightly darker horizontal lines. Orifice pentagonal, nearly entire.

The scutum has broad, distinct, but not very prominent growth-ridges, the articular ridge very strongly developed, half as long as the tergal margin, almost hook-shaped. The adductor ridge remarkably prominent.

The tergum has the spur rather long and narrow, not pointed, but truncated at the extremity; no longitudinal furrow, and very well-developed crests for the depressor muscles.

This form shows great resemblance to DARWIN's var. (1) *communis*, as figured in his Monograph Pl. V, fig. 2 *e*.

The foregoing are the 9 (11) samples of specimens that had to be dealt with. After

long and careful consideration I came to the conclusion that the safest way was to consider them as belonging to two different varieties only: the one already described by DARWIN as var. (1) *communis*, the other different from those proposed by DARWIN, and now named var. (10) *malayensis*, from being, apparently, rather common in the Malay Archipelago. In some respects several of the samples approach to some of the other varieties, as described by DARWIN, but the resemblance was in no case complete, or so striking, as it was in that of sample IX, with DARWIN's figure and description of *B. amphitrite* var. *communis*. The samples can be best divided into the two varieties in the following way:

B. amphitrite, var. *communis* Darwin: the samples IX (certainly) and I, III*c* and VIII (probably).

B. amphitrite, var. *malayensis* n. var.: the samples II, III*a*, III*b*, IV, V, VI and VII.

The two varieties may be distinguished by the following characters:

Var. (1) *communis*: shape of the shell conical, with small orifice, or, where the specimens are crowded, cylindrical, with larger orifice. Radii narrow, with very oblique summits. Colour white, with regular longitudinal stripes of violet or blue-grey colour, crossed by horizontal lines of greyish-white. Scutum with a very prominent adductor ridge and the articular ridge also prominent and half as long as tergal margin only.

Var. (10) *malayensis*: shape of the shell cylindrical or flattened laterally, with large orifice. Radii broad at upper extremity, with somewhat oblique, often concave summits. Colour very variable, from almost white or light rose to dark red and purple; longitudinal stripes of darker colour, freckled with white or red in irregular horizontal rows. Radii often dark red or purple. Adductor ridge of the scutum not very prominent, and the articular ridge more than half as long as the tergal margin (Pl. XIV, fig. 8—17).

I investigated the structure of the body of numerous specimens of different stations. In many respects the specimens of different varieties show the same type, in other points, however, differences of some importance were observed. As might be expected, even specimens of the same locality often show small differences, and these are, of course, more striking when specimens from different stations, although belonging to the same variety, are compared. Not to be too extensive, I will give a general description of the different parts and I will add, for the two varieties, only the principal differences I observed.

Mouth. Labrum (Pl. XIV, fig. 12) with the notch deep, but not very wide at the entrance. The lateral parts are rather broad, with the angles rounded. The normal number of teeth is 4 on each side. They are, as a rule, rather strong and pointed, the innermost one is situated at, or in the entrance of the notch, the others all very close together. The sub-triangular, shield-like thickening, is broad, its vertical dimension considerably shorter than the breadth.

Palpi (Pl. XIV, fig. 12*) elongately oval, with the upper margin straight, or even slightly hollowed out, and the basal margin rounded. The spines on the outer surface are

numerous near the distal extremity; a number of them are placed in a longitudinal row which makes an angle with the basal margin. In the variety *communis* this row is composed of a few spines only, a dozen or there about, and these form a single row, almost giving the impression of separating a rounded and slightly swollen terminal part from the rest of the palpus. The same row is visible in the variety *malayensis*, but the spines are much more numerous and disposed in an incompletely double row; the part of the palpus to the exterior of this row, in the latter variety, is perfectly continuous with the remaining part of it. The inner surface of the palpus bears numerous shorter hairs or small spines, a row of them being disposed along a curved ridge, which runs almost parallel to the outer edge of the labrnm, when the palpus is in rest. Very delicate hairs or ciliae are disposed along the under margin of the palpus.

Mandible (Pl. XIV, fig. 13). Teeth 1 and 2 pointed at the extremity, tooth 3 thick or broad; inferior part of mandible, in most specimens, slightly developed only, with teeth 4 and 5 and inferior angle rudimentary, the latter in some specimens quite wanting. Teeth 2 and 3 double at the extremity, teeth 4 and 5 triangular and pointed in some specimens.

Maxilla (Pl. XIV, fig. 14 and 14*). Notch under upper pair of spines absent or only slightly indicated. Inferior pair of spines sometimes on a distinct step-like projection, sometimes this step at the inferior angle is small, sometimes almost wanting. Its size is different, even in specimens from the same locality, yet, generally it can be said, that the step-like projection in the variety *communis*, is developed stronger than is the case in the variety *malayensis*. Between the two pairs of spines, the edge bears from 5 to 7 much shorter spines. They are placed in a single row, their free extremities diverging from the plane of the maxilla, alternatively upward or downward. In the outer part of the maxilla the upper and basal margins run quite parallel; whereas the upper margin is strongly curved towards the apodeme, the outer part of the maxilla is almost quadrate.

Outer maxillae (Pl. XIV, fig. 15). Outer lobe elongately oval, very densely clothed with hairs upon terminal part, and over the whole surface along the inner side; hairs feathered as usual; inner lobe narrow, also elongated, covered with numerous hairs, which are longer on the middle part, directed downward and inward, and much shorter on the inferior part of the lobe.

Cirri. First pair: rami unequal, the number of segments increasing with size or age. The greatest number of segments observed is 14 (15) in the shorter and 20 (21) in the longer ramus. The segments of the longer ramus — with the exception of the terminal ones — are indistinctly separated, those of the shorter ramus are strongly protuberant on their inner faces, and have dense tufts of hairs disposed on these protuberances. In a small individual, 8 (9) and 12 (13) segments only were counted in the two rami of this cirrus; between these two "extremes" all possible combinations were observed.

Second pair: rami slightly unequal, the number of segments varying from 9 in the shorter, and 10 in the longer ramus, to 13 and 14 segments. All the segments distinctly protuberant on their inner faces, and bearing dense tufts of hairs on these protuberances. Other nearly equally dense tufts of hairs are disposed on the outer face, and near the extremity of the segments.

Third pair (Pl. XIV, fig. 16): rami slightly unequal, the number of segments varying from 9 in the shorter and 10 in the longer ramus, to 13 and 14 segments respectively in the two rami. The segments are not very strongly protuberant, but only rounded, on their inner or anterior face. Numerous hairs are disposed on each segment; they do not form, however, such dense tufts as on the segments of the 2nd cirrus. Each segment, on its anterior face, is furnished with a row of small but well-developed teeth, a second row of still smaller teeth being ordinarily seen parallel to that along the margin, and at little distance only from it. In the larger specimens of the var. *communis* from Java, the surface is even covered with several rows of such small teeth, the size of which diminishes from the anterior face towards the other side of segment. In these specimens, a row of somewhat stronger teeth is disposed along the upper margin of each segment. Both rami show these teeth; they are nearly as strongly developed in one as in the other.

Groups of similar teeth are seen also on the lower segments of both rami of the 4th cirrus. I counted in one specimen, the 4th cirrus of which had over 20 segments, about a dozen segments furnished with such a group of teeth, disposed on the surface near the anterior and upper margins of the segment, but not on the anterior margin, as in the 3rd cirrus.

The 3rd cirrus has a dense tuft of long delicate hairs disposed at its basis on the thorax and directed backward.

Fourth-sixth pairs (Pl. XIV, fig. 17): have almost the same structure. In a large specimen the two rami of the 4th cirrus had respectively 22 and 24, of the 5th cirrus 25 and 27, and of the 6th cirrus 26 and 28 segments. In a somewhat smaller specimen the number of segments of the two rami of the 6th cirrus had 25 and 26 segments, in a much smaller specimen these numbers were 20 and 21 only. The segments are furnished on their inner faces with from 4—6 pairs of spines, the middle segments having 5, and sometimes even 6 pairs of such spines, whereas the terminal, as well as the lower segments, are furnished with 4 pairs only. The middle segments are as a rule from $1^1/_2$—2 times as long as broad, the inferior segments are about as long as broad and the terminal segments are over twice as long as broad. The sixth cirrus shows a transverse row of small triangular teeth disposed along the distal extremity of the lower segments. These teeth are developed much more strongly in the var. *communis* than in the var. *malayensis*; they probably grow somewhat stronger with the age of the animals. These rows are already present at the extremity of the segments of the pedicel, and here consist of 10 or more teeth; on the lower segments each row shows 6 to 7 teeth, the number decreasing, until on the middle segments of the cirrus, only 3 or 2 of these teeth are observed. The posterior margin of the segments of the pedicel is hirsute, a large number of extremely small teeth-like spines being disposed along it.

The penis bears a small pointed projection on the dorsal side near the basis. It is not very long, is broad or thick at the basis, and strongly tapering towards the extremity. Few hairs only are scattered over its surface.

Geographical and bathymetrical distribution. This species seems to be common in warm and tropical seas all over the world. In Darwin's Monograph the distribution of the species and also of the varieties is given; the species, according to him, inhabits

inter alia Ceylon, the Philippine Archipelago, the East Indian Archipelago, the east coast of Australia and New Zealand. Var. (1) *communis* occurs in the Philippine Archipelago, and in New South Wales; var. (2) *venustus* in Ceylon; var. (7) *obscurus* in Australia; var. (8) *variegatus* in New Zealand; var. 9 *cirratus* Mouth of Indus, Australia, Philippine Archipelago. WELTNER, (Verzeichniss, 1897) reports that the Berlin Museum possesses specimens of the species itself from Burma, from Singapore, and from Manila; and in the same Museum the var. (1) *communis* is represented by specimens from Singapore, from Manila, from Makassar, and from Surabaya, and the var. (9) *cirratus* from British Burma, Saygon and East India (or China). ANNANDALE (Cirripedia, Pearl Oyster Fisheries, Gulf of Manaar) observed specimens of the var. (1) *communis* and (2) *venustus*, on shells, ropes, and submerged baskets at Galle and in the Gulf of Manaar. Hence the variety (1) *communis* appears to be rather common in this part of the Pacific, and the new variety (10) *malayensis*, seems also to be fairly general. The species itself is found in shallow water, often attached to floating objects, ships-bottoms, etc. The Siboga collected it on different occasions, during shore-exploration, as well as when dredging. The most typical specimens of the var. (1) *communis* were taken from a piece of floating Bambusa; other specimens were taken from a piece of wood, which was perforated to a considerable extent by the tunnels of *Teredo*, and, perhaps, in floating condition only was occupied by the *Balanus*. The small specimens collected at Station 2, which show resemblance to the variety *communis*, were dredged at a depth of 56 m. The specimens of the var. (10) *malayensis* were found attached to small stems, various shells, etc. and these objects were dredged in water of depths varying from 13 to 40 m.

General Remarks. Two specimens of a *Balanus* were collected at Station 99, which, probably, belong also to this species; the smaller specimen only was furnished with opercular valves and these, though very small, look very much like the same valves of *B. amphitrite*. The other specimen is somewhat larger, is pink coloured, longitudinally striped with red, and its general appearance is much like that of the species here under consideration.

These specimens were collected at:

Stat. 99. June 28—30, 1899. Lat. 6° 7'.5 N., Long. 120° 26' E.; Depth 16—23 m. Lithothamnium-bottom. (Anchorage off North-Ubian).

3. *Balanus alatus* n. sp. Pl. XV, fig. 1—8.

Shell coloured red with darker red stripes; radii broad with the summits oblique and slightly hollowed out. Scutum with the external surface hollowed out in the middle, no adductor ridge, and an articular ridge extending over $^2/_3$ of the length of the tergal margin. Tergum with broad articular furrow, and the extremity of the spur bluntly pointed. Labrum with four teeth on each side of the notch; the hairs on the outer surface of the palpi limited downwards by a distinct row, making a sharp angle with the inferior margin.

This beautiful *Balanus* was collected in deep water. It is represented by two specimens, the larger of which is figured (Pl. XV, fig. 1). It is of conical shape, and has a relatively large orifice. The carino-lateralia are narrow, the lateralia triangular, and very broad towards

the basis. The rostrum is distinctly curved inward with its apical part. The radii are very broad, and their summits slightly hollowed out. The alae are broad also but have the upper margins somewhat convex. The shell is laterally compressed, and seems to have been attached to a narrow object with rounded surface. The basis is calcareous, and shows longitudinal canals running parallel to each other. The compartments have pores, which could not be discovered in the radii. (Pl. XV, fig. 3).

The shell is coloured beautifully red, with longitudinal and horizontal bands of a somewhat darker colour. The tips of the compartments and of the radii are of a lighter red. The radii are striated horizontally.

The scutum (Pl. XV, fig. 2*b* and *d*) has the basal margin longer than the tergal margin; its lines of growth are rather broad and not very prominent. The external surface is not flat, but somewhat hollowed out in the middle; in consequence, the marginal parts — along the tergal and occludent margins — are slightly uplifted. Internally, the articular ridge is prominent and extends over two thirds of the length of the tergal margin. The cavity for the adductor muscle is distinctly indicated, the pit for the lateral depressor muscle very shallow. No adductor ridge can be distinguished.

The tergum (Pl. XV, fig. 2*a* and *c*) has the articular ridge prominent, the articular furrow broad and rather deep. The spur is situated at some distance from the basi-scutal angle, and its extremity is bluntly pointed; the basal margin behind the spur is slightly hollowed out, the carinal margin is somewhat convex, the scutal margin straight. The crests for the depressores are strongly developed. The outer surface of this valve shows also a shallow excavation, the part which is somewhat hollowed out, being of triangular shape and lying between the apex and the middle part of the basal margin.

The following description can be given of the structure of the animal's body:

Mouth. Labrum (Pl. XV, fig. 4) has a shallow notch and four relatively strong teeth disposed on each side.

Palpi (Ibid. fig. 4*) are elongated, slightly broader towards the rounded extremity; the superior margin is almost straight, the inferior margin curved. Along the superior margin numerous hairs are disposed, which increase only slightly in length towards the free extremity of the palpus. Here they form a group with somewhat longer hairs disposed on the outer surface, as well as with the longest of those which form, on the outer surface also, a well-developed double row of hairs arranged along a line making a sharp angle with the inferior margin. The latter margin is occupied by a number of very delicate and short hairs, ciliae, arranged in small groups or brushes. The inner surface also is furnished with hairs, a row of the shortest being arranged parallel to, and at a short distance from, the superior margin.

Mandible (Pl. XV, fig. 5). Extremities of teeth 1 and 2 at a somewhat greater distance from one another than those of 2 and 3. Teeth 2 and 3 double, 4 and 5 small, but distinct. The inferior angle terminating in two extremely small points.

Maxilla (Pl. XV, fig. 6 and 6*). Shape triangular, spine-bearing edge rather long. There are 2 upper spines, but the two at the inferior extremity are combined on one side with

a third; at the other side, however, the two form a group as usual, and the third is of the size of the other spines of the middle part of the edge. There is a very small notch behind the upper pair and the number of spines on the middle part is 3 and 4 respectively.

Outer maxillae have the outer lobe elongated, and this lobe bears hairs only on the distal part of the surface. A single row of hairs is disposed in longitudinal direction on the outer lobe, running towards the outer margin of the inner lobe. Inner parts of inferior lobe furnished with numerous hairs directed inwards and towards the basis of the maxilla.

Cirri. First pair has unequal rami of 7 and 11 segments. The segments are not strongly protuberant on their inner face.

Second pair, rami slightly unequal of 6 and 7 segments.

Third pair (Pl. XV, fig. 7), rami somewhat unequal, of 7 to 8, and 8 to 9 segments. The segments are protuberant on their inner face. On most segments a few small teeth are seen between the hairs disposed on the protuberances. They seem to occur on both rami; they are more distinct, however, on the longer ramus.

Fourth pair, rami nearly equal of 10 and 11 segments: remarkably short.

Sixth pair (Pl. XV, fig. 8), has rami of 16 and 17 segments. Greatest number of pairs of spines on inner face of segments: five. Spines are disposed on the dorsal surface of each segment, and form a little tuft close to its upper margin. One of these spines is longer than the others, and about half as long as the segment.

Penis broken off, not seen.

Eggs in the interior of the shell-cavity rather numerous, egg-lamellae broken, present in both specimens. Larvae with Nauplius-appendices and eyes seen in the eggs. Greatest diameter of eggs about 0.24 mm.

The two specimens of this small species were observed at:

Stat. 97. June 28, 1899. Lat. 5° 48′.7 N., Long. 119° 49′.6 E. N. E. of Sulu-Archipelago. Depth 564 m. Bottom: coarse, coral-sand.

General Remarks. This species in several respects approaches *B. amphitrite*, but is distinguished at once from that species by the structure of the scutum, which, in this species, has no adductor ridge. The shape of the parts of the mouth and of the cirri resembles that of the same parts in *B. amphitrite*. There might be, perhaps, sufficient reason to consider this new species as the deep-sea form of DARWIN's species. Under *B. minutus* which seems to belong to the same group, I point out the differences between that species and the present one.

4. *Balanus minutus* n. sp. Pl. XV, fig. 9—16.

Shell of a pink colour with reddish stripes, radii broad, with their summits oblique. Scutum without adductor ridge, and with prominent articular ridge; tergum with the spur pointed at the extremity. Labrum with three teeth on each side of notch, palpi with the hairs on the outer surface not disposed in a distinct longitudinal series.

This almost microscopic species is represented by a single specimen. It is attached to a jointed thread which belongs to a Crinoid. Its shape (Pl. XV, fig. 9) is conical, and it

is somewhat flattened laterally. The carina reaches higher upward than the other valves. The carino-lateral is narrow; the lateral broad, with the surface divided by longitudinal folds into three parts. The colour is pink with red stripes, longitudinal and horizontal, all over the surface. The orifice is rather large and somewhat toothed. The radii are rather broad, and have oblique, slightly hollowed out, summits. They are of a light red colour, the alae being white and having the summits straight.

The structure of the compartments could not be investigated without destroying the small specimen; I presume the parietes to be with pores and the radii to be without pores.

The scutum (Pl. XV, fig. 10, *a* and *b*) is indistinctly furrowed, the growth-ridges being only slightly prominent. The outer surface is not flat but feebly hollowed out in the middle longitudinally. Internally, the articular ridge is not very elongated, but rather prominent. The pit for the depressor muscle is well-developed as also is the cavity for the adductor muscle. No trace of an adductor ridge can be seen.

The tergum (Pl. XV, fig. 10*c*), has the apex blunt, the scutal margin straight, the basal margin distinctly hollowed out, and the carinal margin slightly convex. There is no longitudinal furrow, but a shallow longitudinal depression parallel to the scutal margin. The spur is separated from the basi-scutal angle by a distinct excavation, and the posterior margin of the spur slopes into the basal margin; spur bluntly pointed at the extremity.

With regard to the structure of the animal's body the following may be of interest:

Mouth: labrum (Pl. XV, fig. 11) has a rather deep notch, and the lateral parts rather short. On each side of notch three stout, triangular, pointed teeth are seen.

Palpi (Pl. XV, fig. 11) of oval shape, not elongated, only one and a third times as long as broad. The hairs on the outer surface are not disposed in a row, but form a somewhat irregular group near the free extremity of the palpus. They do not reach farther over the outer surface than half way its length. No groups of short hairs along inferior margin. The inner surface is furnished with very numerous hairs, which are partly recurved.

Mandible (Pl. XV, fig. 12), has the first tooth sharp, and the distance between the extremities of teeth 1 and 2 greater than that between 2 and 3. Third tooth double, fourth small, but also double, fifth very small and the inferior angle rudimentary.

Maxilla (Pl. XV, fig. 13) of triangular shape, with a notch behind the two upper spines, three spines on the middle part, and two strong spines on a slightly elevated part near the inferior extremity of the edge. The length of the middle spines about three quarters of the length of the spines of the upper pair.

Outer maxillae (Pl. XV, fig. 14) have the outer lobe not very elongated, and with a rather broad basis; the outer margin is strongly convex, the inner margin nearly straight, the free extremity somewhat pointed. A distinct row of spines extends over the outer lobe, directed towards the rounded inner lobe.

Cirri. First pair has very unequal rami of 5 and 12 segments.

Second pair has the rami nearly equal, of 6 to 7, and 7 to 8 segments; each segment slightly protuberant only on its inner face.

Third pair slightly longer than the 2nd pair, number of segments 7 to 8, and 8 to 9,

in the other ramus. Few (2—3) and small teeth (Pl. XV, fig. 15) are disposed on the protuberant parts of the anterior face of some of the middle segments of both rami.

Fourth to sixth cirrus have the same, or nearly the same structure, the only difference being that the number of segments increases a little from the 4th to the 6th: the number of segments is 13 and 15 in the fourth, whereas the sixth pair has 16 and 17 segments. The greatest number of spines (Pl. XV, fig. 16) observed on the inner face of the segments was four pairs. The spines disposed on the dorsal surface of each segment, close to its upper margin, are very short in this species.

Penis not very long, narrow in the distal part. Hairs scattered over surface and forming a little tuft at the extremity.

The only specimen was collected at:

Stat. 117. July 12, 1899. Lat. 1° 0′.5 N., Long. 122° 56′ E. Kwandang-Bay-entrance. Depth (chart) 80 m. Bottom: sand and coral.

General Remarks. This species shows resemblance to my new species *B. alatus*; the shape of the opercular valves, and the structure of the parts of the mouth as well, is, however, different, and as the two forms, moreover, inhabit quite different depths (*B. alatus* living at a depth of 564 m. is a real deep-sea species) I think the safest way is to consider and to describe them as different species.

3. Sectio: **Striato-Balanus**

5. *B. amaryllis* Darwin. Pl. XV, fig. 17—21. Pl. XVI, fig. 1—4.

Darwin, Ch., Monograph, The Balanidae, Verrucidae etc. 1854. p. 279, pl. VII, fig. 6.

Of this species, which, according to Darwin is distinct and well-defined, samples were taken on different occasions:

I. Stat. 50. April 16/18, 1899. Bay of Badjo, West coast of Flores. Depth up to 40 m. Bottom: mud, sand and shells, according to locality.

A single beautiful specimen, attached to a shell of a small *Tridacna*-like oyster. The shape of the shell is conical, the orifice is large, pentagonal, toothed. The colour is rose-red, the inferior half, slightly darker than the upper half, and darker and lighter transparent stripes of the same colour run longitudinally over the surface. Radii very narrow, reddish, with the upper margins very oblique, while the alae are broader and of a lighter colour.

Size of the specimen: greatest diameter of the basis 17 mm., greatest height of the rostrum 14 mm.

II. Stat. 258. December 12/16, 1899. Tual-anchorage, Kei-islands. Depth 22 m. Bottom: Lithothamnium, sand and coral.

Numerous specimens of different size and shape. The larger, are nearly cylindrical specimens with a cylindrical cup-formed basis, the shell growing wider towards the orifice. The colour

of the basis is white, that of the compartments reddish, with longitudinal stripes, some of which are darker, others lighter than the rest of the surface. The narrow radii have very oblique summits, and are of a dirty white colour, the alae are broader, are of a darker colour and have their summits rounded. The sheath is as a rule of a dark purple. The smaller specimens are of a conical shape, and are mostly coloured more vividly than the longer: rose-red, with somewhat darker longitudinal stripes. The orifice, in the cylindrical specimens especially, is very large and distinctly toothed; the upper extremities of the compartments are — especially in the larger specimens — slightly curved inwards.

Size of the specimens: the largest specimen is 4.8 cm. high, half of which height is for the cupformed basis, the greatest diameter near the orifice is 2 cm. and that of the basis, near the lower extremity 13 mm. The specimens are crowded together and attached to pieces of calcareous stone.

III. Stat. 273. December 23/26, 1899. Anchorage of Pulu Jedan, East coast of Aru-islands (Pearl-banks). Depth 13 m. Bottom: sand and shells.

A single complete and larger specimen, attached to the shell of an oyster. Half-a-dozen smaller specimens, which are incomplete, being without opercular valves, are attached to the same shell.

The shape of the shell is cylindrical rather than conical, upper extremities of the rostrum, the lateralia, and the carina, slightly curved inwards. Orifice large, pentagonal, toothed. Colour greyish white, here and there yellowish, with slightly darker longitudinal lines on the main parts of the compartments. Radii have very oblique summits, are broadest at a little distance from the orifice, and grow narrower towards the basis. The alae are broader than the radii, and have their summits rounded.

Size of the specimen: the greatest height is 18 mm., the greatest diameter at the upper extremity 16 mm. The other specimens are much smaller, they are partly overgrown by a dark-greyish sponge-like creature, partly naked, coloured dirty white or reddish.

IV. Stat. Jedan-islands — about the same locality from which the specimens from Station 273 were taken.

Several small specimens, nearly all broken, apparently young, and certainly not full-grown animals.

The shape of the shell is more conical, the orifice is in consequence smaller, distinctly toothed in one, less distinctly in another specimen. The colour is pale red, with darker red longitudinal lines. The radii are narrow, their upper edges oblique.

These are small specimens: the greatest diameter of the largest specimen measures at the most 8 mm..

The shape and the structure of the opercular valves of the specimens of the different localities show great resemblance and correspond almost exactly to DARWIN's description.

The scutum (Pl. XV, fig. 17*a* and *c*) is plainly striated longitudinally, the striae dividing the prominent lines of growth into squarish beads. Internally, the articular ridge is

short and slightly prominent; the adductor ridge is more strongly developed than in DARWIN's figure and description. It can be traced to the apex of the valve, and it describes downwards a well-defined arch. The cavity for the lateral depressor muscle is rather distinct, that for the adductor muscle, in the larger specimens, has developed into a regular pit.

The tergum (Pl. XV, fig. 17*b* and *d*) in some of the larger specimens is distinctly striated longitudinally, in others no trace of such striae is seen. The longitudinal furrow is well-developed in most specimens. The length of the spur is rather unequal in different specimens, even in those from the same locality. Where it is long, its length surpasses that of the part of the basal margin situated between the spur and the basi-scutal angle. The spur is short in the specimen from Station 273. In the same specimen, the scutal margin of the tergum is much less curved than is the case in the specimens from other localities.

The structure of the parts of the mouth and of the cirri was found much as is described by DARWIN. For the comparison of these parts with the same parts in other species, it has, however, been thought useful to give here a more detailed description.

Mouth. Labrum (Pl. XV, fig. 18) with the notch wide at the entrance, but not very deep. Lateral parts rounded, with 3 small teeth on each side of notch. Shape of subtriangular shield-like thickening considerably broader than its longitudinal dimension.

Palpi broad, stout, strongly swollen in the distal part, their shape being quadrate, with rounded angles: the upper margin nearly straight, going over with a rounded angle into a distal margin, which, with a broader rounded angle, goes over into a much shorter basal margin. The outer surface bears numerous spines or bristles on a triangular portion, near the angle formed by the upper and distal margins, the lower spines being disposed along a curved line, the hollow side of which is directed towards the under margin. Hairs along upper margin and inner side numerous.

Mandible (Pl. XV, fig. 19) has the free edge long, in so far as the distance between the extremities of teeth 2 and 3 equals or even surpasses that between the extremities of teeth 1 and 2. The part behind the 3rd tooth rudimentary: 4th tooth represented by a triangular pointed knob, 5th tooth and inferior angle together represented by a blunt knob. Tooth 2 distinctly double-pointed, tooth 3 also double, but blunt.

Maxilla (Pl. XV, fig. 20) has a small notch behind the upper pair of spines, and has the inferior part of the edge developed into a very prominent step-like projection. Two long spines are situated on this projection, which, moreover, bears at the inferior angle a number of spine-like hairs. Between the notch and the step-like projection, the nearly straight edge bears 5—6 pairs of spines, and a single spine. Apodeme long. The step-like projection of one of the maxillae of the specimen from Station 273 was occupied by 3 spines, the middle one being somewhat thinner and shorter.

Outer maxillae (Pl. XVI, fig. 1) have the outer lobe elongately oval, a large part of the inner surface furnished with numerous hairs; a longitudinal group or row of hairs extends from the outer to the inner lobe. Inner lobe relatively large, of a somewhat quadrate shape with rounded angles. In the specimen from Station 273, the hairs on the outer lobe are more delicate and shorter, and are disposed at greater distances from one another.

Cirri. First pair (Pl. XV, fig. 21): rami unequal, sometimes very unequal. Number of segments observed: 13 and 24, 17 and 32, 17 and 25, 13 and 24, 12 and 18. The lower segments of the longer ramus are separated only indistinctly, those of the shorter ramus are very protuberant.

Second pair (Pl. XVI, fig. 2): rami slightly unequal. Number of segments observed: 15 and 16, 18 and 19, 16 and 17, 16 and 17, 14 and 16. Most of the segments are distinctly protuberant, with tufts of hairs placed on the tip of the protuberances.

Third pair (Pl. XVI, fig. 3): rami slightly unequal. Number of segments observed: 18 and 21, 29 and 30, 23 and 26, 18 and 20. Segments not protuberant, but having the anterior face rounded off. A tuft of hairs is situated on the extremity of this rounding, the surface of which, moreover, is furnished with several rows of extremely small teeth. The margin of the segment bears no teeth. The thorax bears a tuft of hairs or bristles at the basis of the 3rd cirrus.

Fourth and fifth pair with from 45—52 segments. Surface of pedicel of 5th cirrus rough, with numerous minute, spine-like teeth.

Sixth pair has 54 to 55 segments in one specimen, 70, 75, 59, 58 segments respectively in the other specimens. Segments in the middle part of the cirrus (Pl. XVI, fig. 4) as long as broad, towards the free extremity longer than broad, towards the basis shorter. As a rule each segment has two pairs of very long spines on its anterior face, but sometimes, and then not even in both rami, some of the middle segments have a 3rd pair of very small spines. Between the spines of each pair, and immediately beneath them, there is a dense brush of short hairs. These brushes are stronger, the number of hairs greater, at the basis of the distal pair of spines of each segment. Each segment bears a group of short hairs on the posterior face near the upper extremity. The surface of the lower part of the cirrus, to about the 15th to 20th segment, is rough with numerous microscopical spine-like teeth.

Penis not very elongated, much thicker towards the basis, tapering towards the extremity. It is furnished, dorsally, near the basis, with a recurved hook-like point.

Geographical and bathymetrical distribution. DARWIN knew this species only from the 3rd and 7th provinces, which he distinguished for the distribution of the Cirripedia: the Indian Archipelago and Australia. WELTNER (l. c. p. 270) mentions specimens from Shanghai, and the "Challenger" collected it near Kobe, Japan at two different places, where the depth varied between 14.5 and 90 m. Its occurrence at different places in the Malay Archipelago is proved again by the material collected by the Siboga. It has there been found in shallow water only: the greatest depth from which it was dredged during the cruise of H. M. S. "Siboga" was "up to 40 m.". The "Challenger" found it in Torres Strait at a depth of 14.5 m. According to LANCHESTER[1], a variety of this species is found at Khota Bharu, Kelantan.

6. *Balanus bimae* n. sp. Pl. XVI, fig. 5—11.

Shell conical, globular near the basis, with small and distinctly toothed orifice striped

[1] LANCHESTER, W. F., The Crustacea of the Skeat-Expedition. Proceed. of the Zoolog. Soc. London. II. 1902.

with light rose and red. Radii extremely narrow with oblique summits, alae narrow also and with oblique summits. Scutum plainly striated longitudinally; tergum with the spur broad, without a longitudinal furrow.

This species in several respects resembles *B. amaryllis*, and belongs no doubt to the same division of the genus. It is represented by two specimens.

The general shape of the shell (Pl. XVI, fig. 5) is conical, with the basal part, in the larger specimen especially, rather swollen, and a relatively small and deeply toothed orifice. The shell is slightly compressed laterally, in consequence of its being attached to a narrow and rounded surface. The basis is hollowed out, with the concavity directed towards the object (sponge?) to which it is attached; this basis is calcareous; I could not make out if it has pores. The compartments and radii have no pores. The radii are narrow, and have the summits very oblique; the alae are only slightly broader, they have the upper margins rounded and oblique. The colour of the shell and radii is pale red, with darker and lighter longitudinal stripes, crossed by a few horizontal and lighter-coloured bands. The alae are much lighter, almost of a white colour. The larger specimen measures 11 mm. (greatest breadth at the basis), and has a height of 9.5 mm. In the smaller specimen these measurements are 7 and 5.5 mm. respectively.

Scutum and tergum in general appearance resembling very much the same parts in *B. amaryllis*. The longitudinal striae on the scutum (Pl. XVI, fig. 6, *a* and *c*) of the present species are, however, still more distinct, hence the whole surface is divided into little squares in a more prominent way. The inner surface of the scutum is coloured purplish-red, and is distinctly furrowed longitudinally, especially in the basal part. The adductor ridge can be made out only in the superior half of the valve, the articular ridge is narrow, and about half as long as the tergal margin.

The tergum (Pl. XVI, fig. 6, *b* and *d*) has the scutal margin hollowed out, the apex beaked. There is no longitudinal furrow. The spur is short, and cut off in an oblique direction. Its length is a trifle longer than its distance from the basi-scutal angle. Crests for the depressor muscles few and not very prominent.

With regard to the structure of the animal's body, the following may be said:

Mouth. Labrum (Pl. XVI, fig. 7) with a rather deep notch, and three teeth situated close together on each side of notch. The two margins of the labrum on each side of the notch together make an angle; therefore the whole shape of the shield-like portion, is more quadrate than triangular. The teeth are triangular, pointed at the extremity.

Palpi with the basal margin strongly arched, hence the whole shape is swollen as in *B. amaryllis*. Numerous longer hairs are situated close together on a triangular portion of the outer surface at the free upper corner. Hairs along upper margin numerous; those of the inner surface are arranged above and along a distinct ridge, which runs parallel to the upper margin. When the palpi are at rest, a row of these hairs disposed along the ridge, falls over the edge of the labrum.

Mandible (Pl. XVI, fig. 8). Distance between extremities of teeth 1 and 2 about the same as that between 2 and 3. The latter teeth double. The 3rd somewhat thicker, the 4th small, 5th and inferior angle form together a blunt projection. The part of the mandible behind the 3rd tooth only slightly developed.

Maxilla (Pl. XVI, fig. 9 and 9*). Two superior and two inferior spines of about the same length; the latter situated on a step-like projection. A notch behind the two superior spines, and a smaller one at the basis of the step-like projection. Between the two, the edge bears 8 to 9 spines, some of them in pairs and together forming two indistinct rows.

Outer maxillae (Pl. XVI, fig. 10). Outer lobe oval, inner lobe somewhat quadrate, with rounded angles as in *B. amaryllis*. A large part of inner surface of outer lobe covered with hairs, a group of which runs longitudinally towards inner lobe. Hairs on inner lobe numerous, those placed near interior margin longer and directed towards the basis of the maxilla. The stronger hairs are as usual distinctly feathered.

Cirri. First pair: rami unequal of 10 and 20 segments; 7 lower segments of longer ramus only indistinctly separated. Segments 5—8 of shorter ramus with their inner faces strongly protuberant.

Second pair: rami nearly equal of 11 and 12 segments; segments 5—10 in both rami distinctly protuberant.

Third pair: rami have 16 and 17 segments, and most segments slightly protuberant. No teeth along the margin of the protuberances; their surface, however, is rough from the presence of short microscopical spines. The dorsal surface of the pedicel near the extremity, and of the lower segments of the rami, also rough in consequence of the presence of numerous very short spine-like teeth. A small tuft of long hairs is placed on the dorsal face of the 1th segment of the pedicel. A denser tuft of similar long hairs is seen on the thorax beneath and behind the pedicel of this cirrus.

Fourth-sixth cirrus of about the same structure.

Sixth pair: rami have 41 to 42 segments. The segments of the basal part — about 17 in all — are as long as broad or even shorter; the 15 middle segments gradually grow longer, till the last are twice as long as broad; the 10 terminal segments are more than twice as long as broad. The last 12 segments bear two pairs of spines on their anterior faces, these spines differing considerably in size. The middle segments (Pl. XVI, fig. 11) have three pairs: the outer pair more than twice as long as the segment, the middle pair about same length as segment, or a little longer, the lowest pair very short. Between the two spines of the two upper pairs a few — 2 to 3 — small hairs are situated, which are delicate and short, and do not form a distinct tuft as is the case in *B. amaryllis*.

Penis short, not quite $^1/_8$ the length of the sixth cirrus, strongly tapering towards the extremity. The basi-dorsal point is well-developed but shorter, with the extremity blunt and not recurved as in *B. amaryllis*.

Both specimens were found attached to a specimen of a sponge. They were collected at:

Stat. 47. April 8—12, 1899. Bay of Bima, near South fort. Depth 13 to 31 m. Two specimens.

General Remarks. This species no doubt comes very near to *B. amaryllis*. The general shape, the mode and the object of attachment, and several details in the structure of the animal's body, however, sufficiently justify my considering it a different species.

7. *Balanus albus* n. sp. Pl. XVI, fig. 12—13, Pl. XVII, fig. 1—6.

Shell white, striated longitudinally and, in older specimens, indistinctly folded horizontally. Radii narrow, with very oblique summits; alae broad, with the summits rounded. Scutum with very delicate longitudinal striae; tergum with the spur broad and without a longitudinal furrow.

This species in many respects resembles *B. amaryllis* and might be considered as the deep-sea form of that species.

The shell (Pl. XVI, fig. 12) is bulky, about as broad as high, with most of the compartments horizontally and longitudinally more or less convex, the orifice large, pentagonal and irregularly toothed, the basis either rounded, or if the object to which the shell is attached is narrow, ovate. The radii are narrow, broader towards the basis, with the summits very oblique, and either straight or feebly hollowed out. The alae are broader, their summits rounded and often partly broken off like the tips of the compartments. The upper parts of the compartments are often damaged, the inferior parts on the other hand are thick and strong, in older specimens especially. The colour is uniformly dirty white; the older specimens are striated longitudinally all over the surface, with a few horizontal growth-ridges. The smaller specimens are more hyaline-white. No epidermis is seen. The compartments have no pores, but longitudinal ribs, more strongly developed towards the basis, are seen on the inner side. The sheath is white and horizontally striped. The radii also have no pores; the basis is represented by an extremely thin calcareous plate, which shows numerous ridges extending from the centre towards the periphery; here and there they have the appearance of canals, but I failed to make out canals or pores in a transverse section of this basis.

Scutum (Pl. XVI, fig. 13, *a* and *c*) with distinct growth-ridges, and a pearly lustre over the surface, very delicately striated longitudinally. On the inner surface the adductor ridge is only feebly developed, and the adductor muscle cavity is indicated by two longitudinal grooves; the articular ridge is very prominent, and reaches as far as half the length of the tergal margin. The pit for the depressor muscle is rather deep.

Tergum (Pl. XVI, fig. 13, *b* and *d*) with the scutal margin only very feebly hollowed out, accordingly the apex can hardly be said to be beaked. No longitudinal furrow, but a distinct crest runs in a curved line almost from the apex to the extremity of the spur. Spur short, obliquely truncated at the posterior side. That part of the basal margin which lies between the basi-scutal angle and the spur is hollowed out, and not shorter than the anterior margin of the spur. Crests for the depressor muscle only feebly developed.

The investigation of the structure of the animals body gave the following results:

Mouth. Labrum (Pl. XVII, fig. 1) with the notch wide at the entrance, but not deep; 3 small, blunt teeth are situated close together on each side of notch. Edge of lateral parts slightly hollowed out, margin furnished with extremely small hairs, and a few more small indistinct teeth towards lateral extremity. The sub-triangular shield-like portion much broader than it is high. (In one of the specimens quite a row of small teeth is observable along the edge of the labrum).

Palpi stout, upper margin nearly straight, basal margin slightly arched, the two separated from each other by a nearly longitudinal distal margin. Hairs of the outer surface scattered

over large part of it, numerous, disposed in several rows and close together; the most distal ones form a slightly elongate tuft, with some of the hairs disposed along the upper margin. The hairs of the inner surface are short, curved and distinctly feathered; they form a kind of brush, falling over the edge of the labrum, when the palpi are not erect.

Mandible (Pl. XVII, fig. 2) with the third tooth broad or thick, the 4th and 5th well-developed and pointed, the inferior angle represented by a very small, rudimentary tooth, or almost quite obsolete. Teeth 2—4 double. Distance between extremities of teeth 1 and 2 considerably greater than that between teeth 2 and 3.

Maxilla (Pl. XVII, fig. 3 and 3*) with the edge nearly straight. The upper pair of spines well-developed, the inferior pair not so conspicuous as in many other species, and situated at a considerable distance from the inferior angle. The inferior part not developed into a step-like projection. Beneath the upper pair a very small notch is seen, with a few hairs disposed at the bottom. Between the two pairs of somewhat larger spines the edge bears 4 pairs and one or two single, or 5 pairs of well-developed spines of nearly equal strength. The part of the edge behind the inferior pair of spines is furnished with a series of spine-like hairs. Upper and basal margins of the maxilla nearly parallel towards the extremity, distal part almost quadrate in consequence.

Outer maxillae (Pl. XVII, fig. 4). Outer lobe relatively short and broad; a large part of its anterior surface is furnished, as a rule, with short hairs; no longitudinal series of hairs extends from the outer to the inner lobe. The latter bears feathered hairs, most of which are directed towards the interior and towards the basis of the maxilla.

Cirri. First pair has the two rami very unequal, the one having 11, the longer ramus having 16 segments (the same cirrus of the other side in this specimen has 11 segments in both rami). In another specimen the numbers of the segments were 11 and 15 respectively in the one, and in the other cirrus 11 and 16. The segments of the shorter ramus are strongly protuberant.

Second pair. Rami nearly equal, of 15 or 16 segments; segments very protuberant on their inner face, with dense tufts of hairs disposed on the protuberances. Both rami of this cirrus nearly straight.

Third pair. Rami unequal, distinctly curved at the extremity, of 19 and 21 segments respectively. Protuberances flattened, furnished with brushes of less numerous, but longer hairs than on second cirrus. No trace of teeth along the protuberant parts of the segments.

Fourth-sixth pair. Rami long; segments, although short, very numerous. In the sixth cirrus in one of the specimens, 50 segments can be counted in both rami. Their anterior margin is slightly protuberant and bears two pairs of long spines, the distal pair of which is longer than the other pair (Pl. XVII, fig. 5). Two to three short stiff hairs form a little brush between the two spines of the distal pair, a couple of delicate hairs are situated in the same way between the spines of the shorter pair. On some of the segments, a third pair of microscopical spines (hairs) could be made out — but not on all. The number of segments in the 6th cirrus of a smaller specimen is about 44.

Penis with characteristic point near basis well-developed. Basal part very thick, terminal part narrower, tapering towards the extremity. Length moderate.

H. M. S. "Siboga" collected about a dozen specimens of this characteristic species. The larger specimens have a basis of 17.5 × 14 mm., and the greatest height measures about 17 mm. They are found attached to shells of different Gastropodous Molluscs: a *Fusus*-like species, and others, all more or less broken. Some of the specimens are crowded together so as to hinder each other in their development, others are isolated. The species was collected at:

Stat. 12. March 14, 1899. Lat. 7° 15′ S., Long. 115° 15′.6 E. Depth 289 m. Bottom: mud and broken shells. 12 specimens of various sizes.

Stat. 95. June 26, 1899. Lat. 5° 43′.5 N., Long. 119° 40′ E. Depth 522 m. Bottom: stony. One small specimen.

Stat. 260. Decbr. 16 and 18, 1899. Lat. 5° 36′.5 S., Long. 132° 55′.2 E. Depth 90 m. Bottom: sand, coral, and shells. One small specimen, the largest diameter of the basis of which measures 6.5, the smallest 5 mm.

General Remarks. The structure of the labrum with the row of small teeth along the edge is interesting, in so far as such small teeth are likewise seen along the edge of other deep-sea species of the genus *Balanus*, and the nearly-related genus *Hexelasma*. The form and structure of the opercular valves makes it highly probable that the small specimen (Pl. XVII, fig. 6) collected at Station 260 also belongs to this species. This would be a new instance of the case already stated, that forms with deep-sea characters occur at depths of about 100 metres or even slightly less. The determination of the small specimen from Station 95 is not quite certain: it is a very incomplete specimen, without opercular valves. Its surface is corroded; the shell has no pores but distinct longitudinal ribs along the interior surface of the compartments, and as the shape of the radii and alae is the same, and the basis corresponds also, I think it is not too risky to place it here.

8. *Balanus maculatus* n. sp. Pl. XVII, fig. 7—13.

Shell conical, dirty white with longitudinal stripes of pale red and more or less numerous red spots. Carino-lateral very narrow. Radii extremely narrow, with the summits very oblique, alae somewhat broader, with the summits rounded. Scutum plainly striated longitudinally; tergum without longitudinal furrow, with the spur broad, its hinder margin rounded, sloping into the basal margin.

This species also resembles *B. amaryllis* in several respects. There is quite a number of specimens in the collection; most of them are attached to wood, a lot of smaller specimens were found attached to a piece of stone.

The general shape of the shell (Pl. XVII, fig. 7) is conical, with the rostrum slightly convex, and the carina straight. The orifice is toothed, but only superficially; it is medium-sized, pentagonal. Its largest diameter is not quite half the largest diameter of the basis. No chitinous membrane over the shell. It is smooth, dirty white, with more or less numerous longitudinal stripes of a greyish-red colour, and more or less distinct spots: either the surface is strongly or weakly spotted, or almost entirely white. The red colour is in several specimens more distinct along the margins of the compartments, and over the surface of the alae. Here and there the longitudinal stripes are crossed by horizontal ones, formed by red dots, which at

other places are mere spots of the longitudinal stripes, or, sometimes, together form regular horizontal stripes. In very young specimens the spots and stripes are often very distinct. The compartments are longitudinally ribbed along the inner side, and have no pores. Basis with delicate canals radiating from the centre. Radii very narrow, with the summits oblique, and no pores. Alae broader with the upper margins rounded.

The scutum (Pl. XVII, fig. 8, *a* and *c*) has narrow and numerous growth-ridges and longitudinal striae crossing the growth-ridges, delicate but distinct, in the larger specimens especially. The striae are more distinct than in *B. albus* and *tenuis*, but not quite so prominent as in *B. amaryllis* and *B. bimae*. The articular ridge is well-developed, extending slightly over half the length of the tergal margin; adductor ridge rather prominent, but only in the superior half of the valve; pit for the depressor muscle rather large and distinct.

The tergum (Pl. XVII, fig. 8, *b* and *d*) has the scutal margin distinctly hollowed out, and the apex beaked. The spur is short and broad; its extremity is cut off obliquely, its posterior margin going over almost insensibly into the basal margin of the tergum. The distance of the spur from the basi-scutal angle is shorter than the width of the spur. There is no longitudinal furrow. The crests for the depressor muscles are moderately developed; numerous longitudinal and parallel ridges occupy the interior surface between the occludent margin and the spur.

The larger specimens measure at the basis 10.5 to 12 mm.; their height is about 7 mm. Most specimens are, however, much smaller.

With regard to the structure of the animals body, the following may be of interest:

Mouth. Labrum (Pl. XVII, fig. 9) with the notch not very deep, wide at entrance and 3 well-sized teeth on each side, standing close together. In one instance, two teeth were seen on one side and three on the other. Lateral parts with the upper margin rounded; the interior terminal part of the sub-triangular portion relatively narrow.

Palpi nearly quadrangular, or elongately-quadrangular, with the upper margin straight, only slightly hollowed out in the middle, the inferior margin distinctly convex, gradually going over in the distal margin, which makes an angle with the upper margin. A dense row of short hairs disposed in several rows along the upper margin. The outer surface, near the angle where upper and distal margins meet, is furnished whith a dense group of longer hairs, which together form a tuft, extending far beyond the shorter hairs arranged along the upper margin. This group of longer hairs occupies an almost triangular corner of the outer surface, and terminates with a row of similar hairs, which make an angle with the basal margin of the palpus; the inferior part of the outer surface without hairs. The distal margin is furnished with only a few microscopical hairs. The inner surface is furnished with shorter and curled hairs; a longitudinal row of such hairs is inserted parallel to a fold or rim which, if the palpus is not elevated, extends along the free margin of the labrum.

Mandible (Pl. XVII, fig. 10) with the first and second teeth sharply pointed, the third slightly shorter and blunt. Teeth 2 and 3 indistinctly double at the extremity. The distance between the extremities of teeth 2 and 3 nearly equals that between teeth 1 and 2. Fourth tooth small, fifth rudimentary, the part of the mandible behind the 3rd tooth small.

Maxilla (Pl. XVII, fig. 11 and 11*) short, edge relatively long, shape triangular.

Upper pair of longer spines about as long as lower pair. Behind the upper pair, there is a distinct notch, which in one specimen is smaller than in the other. The inferior pair cannot be said to be placed on a special projection — yet it is situated somewhat above the level of the other spines, and a small notch, in some specimens, also separates these two spines from the middle ones. Between the upper and inferior pairs 5 to 6, spines are disposed along the edge. These are much shorter and thinner than those of the upper and inferior pairs.

Outer maxillae (Pl. XVII, fig. 12) with the outer lobe rather broad, certainly not much longer than it is broad, the extremity towards the interior side bluntly pointed. Hairs cover densely a large part of the inner surface towards the extremity and along the distal margin. A longitudinal group of hairs can be seen to extend over the middle of the said surface to the inner lobe. The latter bears several rows of hairs, of which those disposed along the inner margin are, as usual, directed towards the basis of the maxilla.

Cirri. First pair has unequal rami of 9 and 15—17 segments. The 7—8 lower segments of the longer ramus form a broader basal part; the 8 to 9 remaining segments are of a more elongate shape. The 3rd to 7th middle segments of the shorter ramus have the inner face distinctly protuberant, and dense tufts of hairs are disposed on these protuberances.

Second pair has 9 to 10, and 10 to 12 segments in the two rami, the lowest segment of each ramus being indistinctly composed of three segments. The segments are very protuberant on their inner faces, and the hairs disposed on these protuberances are long and form very dense tufts.

Third pair has the rami slightly more unequal of 11 (12) and 13—15 segments. The segments have the inner or anterior face rounded, but not distinctly protuberant; the tufts of hairs disposed on the anterior face less dense than on the 2nd cirrus. No teeth are observable on the surface of the rounded anterior face.

Fourth pair: number of segments 26 to 27. Three pairs of spines along inner face of middle segments.

Sixth pair: number of segments 27 to 29 — in several specimens, however, the cirri of the last pairs are broken off. The middle segments (Pl. XVII, fig. 13) are slightly longer than broad, with the inner face somewhat rounded and bearing four pairs of spines, the third of which is considerably shorter than the 1st (the most distal one) and the 2nd, the fourth (the basal one) being quite rudimentary. The hairs disposed on the dorsal face, close to the upper margin of each segment, form a group of two or three, one of which is longer and somewhat thicker than the others.

Penis has several hairs scattered over distal part, and a rather dense tuft at the extremity; near its basis the dorsal side bears a short blunt tooth.

This species was taken by the Siboga at two Stations, which are not very distant from one another:

Stat. 49a. April 14, 1899. Lat. 8° 23'.5 S., Long. 119° 4'.6 E. Depth 69 m. Sapeh-strait. Bottom: coral and shells. Numerous specimens, attached to pieces of wood that are much perforated by *Teredo*.

Stat. 310. February 12, 1900. Lat. 8° 30′ S., Long. 119° 7′.5 E. Depth 73 m. Bottom: sand with few pieces of dead coral. Half a dozen small specimens, some of them attached to the shell of a Lamellibranch (*Avicula*), others to a Bryozoan (like *Halodactylus*), others to a species of sponge.

General Remarks. This seems to be a rather common species at the places where it occurs. It doubtless belongs to the group of species of which *B. amaryllis* is the best known.

9. *Balanus tenuis* Hoek. Pl. XVII, fig. 14—19. Pl. XVIII, fig. 1.

Hoek, P. P. C., Report on the Cirripedia of the Challenger Expedition, 1883, p. 154, pl. XIII, fig. 29—33.

This species also belongs to the group of species with narrow radii, striated scuta, terga with the scutal margin hollowed out and relatively broad spur. When describing the species as a new one (1883), I pointed out that it corresponds in several details to *B. amaryllis*. Several other new species of the same group were collected during the cruise of the Siboga.

A pale-red-coloured specimen of considerable size was brought up with the dredge from a coral bottom and a depth of 275 m. It is an incomplete specimen, without opercular valves, and it broke into pieces before I had sufficiently investigated it. A small specimen of the same colour and with valves of corresponding shape, was found attached to one of the compartments of the larger specimen (Pl. XVII, fig. 14). The latter belongs no doubt to the same species.

The shell is conical, its orifice medium-sized, and distinctly toothed. The radii are extremely narrow, with their summits very oblique, in the smaller specimen visible only along inferior half of valves. The alae are considerably broader, wih their sumttmis rounded. The compartments are furnished on the inner surface with vertical ridges, which increase in size and strength towards the basis. Neither compartments nor radii have pores. Of the larger specimen the basis is wanting; the smaller one has a delicate calcareous basis, with ridges radiating from the centre. I could not see any canals in the basis. The diameter of the smaller specimen is 7.5 mm. near the basis, its height 4.5 mm.; the highest compartment of the larger specimen measures 32 mm.

The scutum (Pl. XVII, fig. 15*a* and *d*) is delicately but distinctly striated longitudinally. The inner surface is roughened on the upper part, the adductor ridge is feebly developed, the articular ridge is rather prominent, and extends over half the length of the tergal margin; the tergum (Pl. XVII, fig. 15, *b* and *d*) has the scutal margin only slightly hollowed out, the spur is rather broad, and extends to a distance from the basi-scutal angle, which is not greater than its own width. The valve is slightly beaked. Studying it with a strong lens, a trace of longitudinal striation is seen at the surface.

The description I gave of the animal's body in the Report on the Challenger-Cirripedia can be completed with the following remarks:

Mouth. Labrum (Pl. XVII, fig. 16) with the central notch shallow, wide at entrance, the three teeth on each side close together, the height of the sub-triangular shield-like portion about three-fourths of its breadth.

Palpi slightly elongate, with the upper margin nearly straight, and the basal margin

distinctly curved. Hairs on outer surface long, and distributed over a large portion, situated at some distance from one another, and consequently not very numerous. The tuft formed at the distal and upper angle not very dense. Numerous hairs are disposed along upper margin at small distances from one another, short curved ones are scattered near upper margin over the inner surface.

Mandible (Pl. XVII, fig. 17) has the third tooth stronger than the first and second. Distance between extremities of first and second teeth greater than that between extremities of 2nd and 3rd teeth. Fourth tooth small, fifth confluent with inferior angle, or, though small, separated from it.

Maxilla (Pl. XVII, fig. 18 and 18*) with the two inferior spines not on a step-like projection; notch behind upper spines very small and a spine-like hair inserted at its bottom. Between the two pairs 6 to 7 spines are disposed in a single row along the nearly straight edge.

Outer maxillae (Pl. XVIII, fig. 1) have the outer lobe broad, short, with the interior margin straight, exterior margin arched, the two meeting in an obtuse angle, which makes it look somewhat pointed at the extremity. The inner lobe is short and not distinctly separated from the outer lobe. Hairs are disposed on distal part of surface and along inner margin only of outer lobe, with a longitudinal series extending from the outer to the inner lobe. Hairs on inner lobe not very numerous, most of them directed inwards and downwards, and more distinctly feathered than the other hairs of this maxilla.

Cirri. First pair has unequal branches of 6 (7) and 12 segments respectively. The segments of the shorter ramus are only slightly protuberant, the last one bears a few spines which are stronger than those of the other segments. The last segment of the longer ramus has a few (3 to 4) very long hairs, which look somewhat like spines, disposed on its extremity.

Second pair has 9 (10) segments in each ramus; the somewhat shorter ramus has the outer segments protuberant and that part of the ramus recurved in a curious way.

Third pair has nearly equal rami of 10 to 11 segments; a few very strong and long spine-like hairs disposed at the extremity of the terminal segments. No trace of teeth along anterior face of segments.

Fourth-sixth pairs of cirri of about the same structure, the number of segments only slightly increasing from the 4th to the last.

Sixth pair has 21 segments in each ramus; the distal segments are longer than the basal, but all of them longer than broad. Most segments (Pl. XVII, fig. 19) bear three pairs of spines on their inner faces, two pairs of long ones, and a third (the lower) pair of rudimentary spines. A few spines (forming together a little tuft) are disposed between the two of each pair of longer spines. Hairs on the dorsal surface of each segment, close to its upper margin, not quite three-fourths of the length of the segment itself.

Penis broken off and lost in the specimen I investigated.

This species was observed at:

Stat. 105. July 4, 1899. Lat. 6° 8′ N., Long. 121° 19′ E. Depth 275 m. Coral-bottom. A large incomplete specimen and a small one attached to it.

Geographical and bathymetrical distribution. This species, which was founded

for specimens collected by the Challenger in the Philippine Archipelago at depths varying from 180 to 210 m., has now been found again at a little distance from the former locality, namely, 1 degree more to the West and 6 degrees more to the South. Its range of depth therefore lies between 180 and 275 m., and it must be considered as an inhabitant of deep water. Single or few specimens only were taken on each occasion — it is difficult, however, to judge whether it is common or rare from the results of dredgings.

4. Sectio: **Solido-Balanus**

10. *Balanus socialis* Hoek. Pl. XVIII, fig. 2—12.

HOEK, P. P. C., Report on the Cirripedia of the Challenger Expedition. 1883, p. 150, pl. XIII, fig. 23—28.

At several stations, during the cruise of H. M. S. "Siboga", specimens of a form of *Balanus* were collected, doubtless belonging to the same species, and which certainly show the greatest resemblance to the species I described as *B. socialis* in the Challenger report. The Challenger-specimens were collected in the Arafura Sea at a depth of about 50 m.; they now appear to belong to a form rather common in the Malay Archipelago at depths varying from 9 to more than 69 m. (Pl. XVIII, fig. 2, 10 and 11).

I have not much to add to the description of the shell which I gave in my report of 1883. There is, however, one important difference that I will at once point out. I said with regard to the Challenger specimens, that the walls, as well as the basis, were permeated by pores; the numerous specimens I have now investigated, however, have the walls without pores, and the basis either indistinctly or not permeated. In smaller species of *Balanus* it is often difficult to arrive at a conclusion regarding this detail of the structure. I made figures of two sections of a specimen from Station 164 and I am certain that its walls were not permeated. The fig. 4*a* (Pl. XVIII) shows a section near the orifice, and here the rostrum especially presents, near the outer surface, a row of darker spots which could easily be confounded with pores "filled up with corium". The fig. 4*b* (Pl. XVIII) represents a section of the shell of the same specimen near the basis: there is no trace of pores, but the part representing the rostrum shows clearly that the wall is strengthened interiorly by vertical ribs. I examined specimens from different stations, but I never observed true open pores in the walls. With regard to the basis, I saw in a specimen from Station 164 a basis with pores or canals radiating from the centre; in another specimen, however, I found lists over the basis radiating from the centre and extending to the periphery, and shorter ones alternating with the longer ones, and extending from the periphery without reaching the centre. These lists look much like canals, and have a darker margin and a clearer longitudinal middle part: they are grooves, however, and not canals.

In most specimens the orifice is rather large, its shape elongately-pentagonal; the shell is white, but sometimes, however, dirty-white from mud-particles attached to a thin membrane. The radii are narrow, with rounded margins, the alae triangular, with the upper margin parallel

to the basis, and slightly convex. In some specimens the compartments show longitudinal and somewhat hyaline stripes; others have indistinct horizontal growth-ridges.

The scutum (Pl. XVIII, fig. 3 *a* and *c*) has the growth-ridges not very prominent; its articular ridge is well-developed, extending downwards more than half the length of the tergal margin. The adductor ridge is always visible, but never prominent. There is no trace of longitudinal striae on the outer surface.

The tergum (Pl. XVIII, fig. 3, *b* and *d*) has the spur short, with the extremity rounded or bluntly truncated, standing at less than the length of its free part from the basi-scutal angle; the two parts of the basal margin make together a very obtuse angle; the part between the spur and the carino-basal angle is rather long; the crests for the depressor muscles are numerous and well-developed.

All the specimens are small: the greatest diameter of the basis of one of the larger specimens measures about 4.5 m.

Concerning the structure of the animal's body, I can now give several details which complete the description given in the Challenger report:

Mouth. The labrum has a rather shallow notch, the entrance of which is widened, and three rather strong and pointed teeth on each side of the notch. Sometimes on one, or on both sides, one or even two of the teeth are rudimentary, or wanting — but as a rule three teeth are present on each side.

The palpi are short, broad, and of oval shape. A large part of the outer surface is covered by longer hairs, which develop into a tuft of still longer hairs towards the distal extremity. Along the upper margin numerous smaller hairs are disposed; short hairs, arranged in a distinct row on the inner surface, fall over the edge of the labrum, so long as the palpus is bent downwards.

The mandible (Pl. XVIII, fig. 6) has four nearly equal-sized teeth, the 2nd and 3rd teeth double as usual, and the 4th tooth with a characteristic nob. The 5th is sometimes short and blunt, and separated from the inferior angle, in other specimens it is quite confluent with that angle.

The maxilla (Pl. XVIII, fig. 7 and 7*) has 3 spines situated between an upper pair of the ordinary shape and size, and a lower pair the spines of which are somewhat longer than those of the upper pair. The latter two spines and the 3 intermediate ones have, moreover, a very characteristic shape, being broad, swollen at the basis, and sharply pointed at the extremity. Between the 2nd spine of the upper pair and the first of the three intermediate ones, a very small interspace represents the notch which in other species is much more distinct.

The outer maxillae (Pl. XVIII, fig. 2) have the outer lobe broadly-oval, with the angle at the free extremity rounded. The interior margin is nearly straight. A row of hairs runs parallel to the interior margin from the outer to the inner lobe. The latter bears the usual feathered hairs and is, moreover, characterised by being prolonged in the direction of the basis of the maxilla.

Cirri. First pair has unequal rami: as a rule the shorter ramus has 6, the longer from 9 to 11, ordinarily 10 segments. Of the longer, the five basal ones are only indistinctly separated.

Second pair is short and has slightly unequal rami of 6 and 7 segments; the inner surfaces of the different segments are rounded; they cannot be said to be protuberant.

Third pair has the rami unequal by one segment: 7 to 8, or 8 to 9. The inner margins, near the upper extremity of the segments, show here and there extremely small teeth in some specimens. In other specimens no teeth could be made out.

Fourth-sixth pairs of nearly the same structure; the greatest number of segments counted was 21 to 22. This number slightly increases from the 4th to the 6th, and seems also to increase with age. The smallest number seen in the 4th cirrus of one of the specimens was 16. The greatest number of pairs of spines on the anterior face of the segments (Pl. XVIII, fig. 9) is 4 pairs; the last pair, being that near the inferior extremity of the segments, is always extremely small.

Penis long, growing very narrow towards the extremity; with numerous curled hairs, especially on distal part.

This species was dredged at several stations, and seems to be rather common throughout the whole Archipelago.

Stat. 50. April 16/18, 1899. Bay of Badjo, West coast of Flores. Depth 27—36 m. Bottom: mud, sand, and shells, according to locality. Half-a-dozen specimens attached to a leaf (most probably of a tree). Surface of shell more or less distinctly striped longitudinally.

Stat. 51. April 19, 1899. Southern part of Molo-strait, Madura-bay. Depth from 69 to 91 m. Bottom: fine grey sand, coarse sand with shells and stones. Two specimens attached to a calcareous plate, probably a part of a thin valve of a Mollusc. Specimens beautifully striped longitudinally.

Stat. 162. August 18, 1899. Between Loslos and Broken-islands, West coast of Salawatti. Depth 18 m. Bottom: coarse and fine sand with clay and shells. Several specimens. Some of them attached to the surface of the shell of a *Pecten*. Round about a sponge (?) adheres also to that surface, the colony of *Balanus* extending more or less over the surface of the sponge.

Stat. 164. August 20, 1899. Lat. 1°42'.5 S., Long. 130°47'.5 E. Depth 32 m. Bottom: sand, small stones and shells. Numerous specimens attached to stones, shells of Gastropodous molluscs and other objects, calcareous plates, etc.

Stat. 213. September 26—October 26, 1899. Saleyer-anchorage and Surroundings. Depth 9 to 34 m. Bottom: coral-reefs, mud, and mud with sand. A single specimen attached to a piece of stone.

General Remarks. This species occurs at different depths, and is found attached to very different objects. It cannot be wondered at that it varies, like other species of the genus *Balanus*, not inconsiderably in accordance with the different surroundings midst which it lives. The figure 10 of Pl. XVIII shows a specimen (from Station 164) with a somewhat elongate and narrow carina, and with the other compartments more or less swollen in their basal parts. Fig. 2 of Pl. XVIII shows two specimens (from Station 51) of a more regular conical shape, the compartments of which are beautifully striped longitudinally. Fig. 11 represents a specimen which is very characteristic by the breadth and development of the alae. These parts are, moreover, conspicuous in this specimen because they give one the impression of lying on another plain, the whole surface of the shell being, in consequence, much less flat and regular than is the

case in the other specimens of this species. The specimens belonging to this latter form were found at Station 164. They are characterised also by the shape of the tergum, the scutal margin of which is not straight, but somewhat convex, which makes this valve much broader than in the ordinary form of the species (Pl. XVIII, fig. 2*a* and *b*). I intended at first to describe this form as a variety of this species; since I found afterwards, however, that some specimens from the same locality show these differences in a smaller degree, and others not at all, I prefer to point out the variability without proposing a special name for the form that seems to show this particularity in the highest degree.

There remains no doubt in my mind that this form really corresponds with the species I described in the Report on the Cirripedia of the Challenger as *B. socialis*. As regards the important difference between the definition given in the report of 1883, and the description given here, namely that I ranged the species there under those that have the parietes permeated, I now find that such pores are absent. I have already explained on p. 192, how this error may have arisen.

Further, at another Station, a few very small specimens of a *Balanus* were collected which I suppose to belong also to this species. Their opercular valves are wanting; the diameter near the basis of the largest specimen of the sample measures at the most 3 mm.; the shells are white, have large orifices; their alae and radii show the same shape as in *B. socialis*. They were found attached to small Gastropodous-shells (*Scalaria*?), which were collected at:

Stat. 205. Lohio-bay, Buton-strait. Depth 22 m. Bottom: sandy mud.

11. *Balanus maldivensis* Borradaile. Pl. XVIII, fig. 13—19.

BORRADAILE, L. A., Marine Crustaceans. Parts IV—VII in "The Fauna and Geography of the Maldive and Laccadive Archipelagoes". Vol. I. Part 4. 1903. p. 442, fig. 118.

This species, which according to BORRADAILE, occurs in S. Nilandu Atoll (Maldive or Laccadive Archipelagoes) seems to be a rather common species in the Malay Archipelago. BORRADAILE's description in the main is exact — a somewhat more extensive one, however, will not be judged superfluous.

It is a species (Pl. XVIII, fig. 13) with thick solid walls of a conical or steeply-conical shape; it is often somewhat compressed laterally; the surface of the parietes looks gnarled and often ringed, but not regularly ribbed. The radii are elongately-triangular, having the summits broad and nearly horizontal, and terminating downwards in a point. The summits of the radii are, moreover, straight or slightly concave, the alae, in the latter case, extending slightly beyond the radii. The outer surface of the radii is indistinctly striped horizontally, and lies somewhat deeper than that of the compartments, which gives a very typical appearance to the shell. Orifice oval when seen from above, with the carinal extremity pointed, and the rostral rounded or rhomboidal. Parietes and radii without pores, the inner side of the parietes strengthened by longitudinal ribs. Basis also without regular canals; at the circumference, however, shallow pores are seen beginning in the intervals between the bases of the ribs placed against the parietes. It is a small species: the diameter of the larger specimens measures from 6—7 mm. near the basis, their height from 4—5$^1/_2$ mm.

The scutum (Pl. XVIII, fig. *a* and *c*) has the occludent margin arched, and the tergal and basal margins of about the same length; there is no adductor ridge, and the articular ridge is feebly developed, not at all prominent. On the outer surface the growth-ridges are not very distinct, and no trace of striae can be observed. The whole surface is slightly arched, the apex curved inwards.

The tergum (Pl. XVIII, fig. *b* and *d*) has the scutal margin slightly convex, and the basal margin concave. The outer surface does not show the growth-ridges even so well as the scutum. The spur extends slightly beyond the basal margin, and is rather broad; its anterior margin is separated from the basi-scutal angle by a very short anterior part of the basal margin; in other specimens, however, it is confluent with the scutal margin. Crests for the depressor muscles well-developed. The chitinous membrane covering the tergum bears a distinct group of short hairs along the carinal margin, near the apex. The latter is blunt, not produced.

With regard to the structure of the animal's body, the following was observed:

Mouth. Labrum (Pl. XVIII, fig. 15). The normal number of teeth on each side of the wide notch seems to be 3. Often, on one, or on both sides, only two of these are developed, in which case one of the teeth may be double-pointed. The subtriangular portion representing the thickened part of the labrum terminates on the inside in a somewhat narrower part, looking like a handle.

Palpi with numerous hairs scattered irregularly over large part of outer surface. There is no distinct tuft of longer hairs disposed at the distal extremity of the palpus. Shape of the palpus oval, with the inferior margin distinctly rounded.

Mandible (Pl. XVIII, fig. 16) with teeth 2 and 3 double, and 3 thicker. Distance between extremities of teeth 1 and 2 slighty longer than that between the extremities of teeth 2 and 3. The part behind the 3rd tooth rudimentary: teeth 4 and 5 small, the inferior angle represented only by a minute point.

Maxilla (Pl. XVIII, fig. 17) with the edge nearly straight, a small and shallow notch behind the upper pair, and 3 to 5 somewhat shorter spines situated between this notch and the inferior pair. The notch is narrower in some specimens than in others; as a rule one or two hairs are seen at the bottom of the notch.

Outer maxillae (Pl. XVIII, fig. 18). Outer lobe relatively broad and short, obtusely pointed, and with the inner margin more or less straight. A moderate portion of the inner surface of the outer lobe is covered with hairs, from which a single or double row can be followed to the inner lobe. The latter is somewhat elongated towards the basis, the hairs disposed along its inner surface point towards the basis of the maxilla; they are more distinctly feathered than those of the remaining parts of the maxilla.

Cirri. First pair has the rami unequal, of 6 to 7, and 11 to 12 segments. Anterior faces of the segments of shorter ramus rounded, not protuberant.

Second pair has 7 to 8, and 8 to 9 segments in the two branches. The anterior faces of the segments protuberant, furnished with dense brushes of hairs.

Third pair has 9 to 10, and 10 to 11 segments. Brushes of hairs less dense than on the protuberances of the segments of the second cirrus. No trace of teeth on or along the

anterior margins of the protuberant parts. At the base of the third cirrus, the thorax bears a tuft of long and numerous hairs, the free extremity of which is directed backwards

Fourth to sixth cirri have from 15 to 18 segments in each branch. The anterior face of most segments bears four pairs of hairs (Pl. XVIII, fig. 19); in some specimens, a few segments, the 7^{th}—9^{th} from the end, even bear a 5^{th} pair of extremely minute hairs. Group of hairs disposed at the outer margin, and near the extremity of each segment; it has a single longer hair, which, however, is considerably less than the length of the segment.

Penis broad at the basis, growing narrow, and even very narrow towards the extremity. No projecting point on the dorsal side of the penis observed. Penis very long, much longer than the cirri.

Most specimens of this species, collected at different Stations, were found attached to the spines of, probably, different species of Echinida. Often numerous, most of them small, specimens are seen crowded together along the surface of the same spine. The species was collected during the cruise of the Siboga at the following Stations:

Stat. 49[a]. April 14, 1899. Lat. 8° 23′.5 S., Long. 119° 4′.6 E. Sapeh-strait. Depth 69 m. Coral and shells. Numerous specimens.

Stat. 51. April 19, 1899. Madura-bay and other localities in the southern part of Molo-strait. Depth 69—91 m. Bottom: fine grey sand, or coarse sand with shells and stones. Numerous specimens attached to the spines of an Echinid. (Another sample from the same locality: Strait Molo, is from a depth of 54—90 m.).

Stat. 59. April 26, 1899. Lat. 10° 22′.7 S., Long. 123° 16′.5 E. Western entrance Samau-strait. Depth 390 m. Bottom: coarse coral-sand with small stones. A few dry specimens.

Stat. 302. February 2, 1900. Lat. 10° 27′.9 S., Long. 123° 28′.7 E. Depth 216 m. Bottom: sand and coral-sand. 3 specimens without opercular valves.

Stat. 310. February 12, 1900. Lat. 8° 30′ S, Long. 119° 7′.5 E. Depth 73 m. Bottom: sand with few pieces of dead coral. Group of small specimens attached to the spine of an *Echinus*.

General Remarks. This species, according to ANNANDALE's "On the Cirripedia" Supplem. Report XXXI of Herdman's Report on the Pearl Oyster Fisheries of the Gulf of Manaar, published 1906, Part V, p. 148, is found also in the Gulf of Manaar (Ceylon). It was found attached to a piece of dead coral. Neither BORRADAILE nor ANNANDALE inform us at what depths their specimens were collected; I think we may conclude from this fact, that they did not come from considerable depths. The Siboga dredged it at depths varying from 54—90 m., and also in deep water, at depths of 216 and 390 m. I must point out, however, that these specimens from greater depths (from Stations 59 and 302) are small and incomplete (without opercular valves) and that their determination, in consequence, may always be considered as somewhat uncertain. Species showing such considerable variation with regard to the depth they inhabit, are not common in this genus; where it is the case we should ascertain if such forms from different depths, which look as if they belong to the same species, do not show more or less important differences in details of structure. In the present instance this was impossible by the incompleteness of the specimens from deep water.

BORRADAILE proposed for this species a new section of the genus *Balanus*. I explained on p. 157 of this report why I could not agree with this proposal and what in my opinion would be a better subdivision of the genus.

12. *Balanus auricoma* n. sp. Pl. XVIII, fig. 20—22, Pl. XIX, fig. 1—7.

Shell flatly-conical, colour reddish, with darker red longitudinal lines. Radii narrow, with slightly oblique summits. Opercular valves furnished with golden hairs along occludent margins. Scutum without adductor ridge, and with the articular ridge only slightly prominent, tergum narrow, with distinctly dentated scutal margin.

The shell is flatly-conical, the orifice rather small, of elongately-pentagonal shape and only very superficially toothed. The surface of the valves is feebly ribbed longitudinally, the outer margin at the basis, in consequence, not smooth, but superficially lobed. The specimens (Pl. XVIII, fig. 20) were found attached to the surface of calcareous stones in close proximity of each other. The colour is reddish, darker red lines running along the ribs from the orifice to the basis, red spots being, moreover, scattered over the surface. The radii are narrow, elongate, triangular, their summits slightly oblique. They are distinctly striated longitudinally. Parietes and radii without pores (Pl. XVIII, fig. 21), and no pores seen in basis.

The scutum (Pl. XVIII, fig. 22, *a* and *c*, Pl. XIX, fig. 1 *a*) has the occludent margin straight, and its tergal margin can hardly be said to be hollowed ont. The outer surface is only indistinctly ridged. The shell as a whole is not flat, but somewhat bowed: seen externally, the apical part is slightly lifted up. On the inner surface the articular ridge is not very prominent, but extends along a large part of the tergal margin; the adductor ridge is not to be seen, and the pit for the depressor muscle is triangular, rather broad and shallow.

The tergum (Pl. XVIII, fig. 22, *b* and *d*, Pl. XIX, fig. 1 *b*) is narrow, has the scutal margin straight and unusually distinctly dentated, and the carinal margin short and strongly convex. The basal margin slopes gradually into the posterior margin of the spur; although situated close to the basi-scutal angle, the spur forms a distinct angle with the anterior part of the basal margin. Externally there is a shallow furrow between the spur and the scutal margin; on the inner surface the articular furrow extends over a large part of the shell along the scutal margin. The crests for the depressores are strongly developed; a large part of the interior surface of the valve is coloured beautifully rose-red.

The epidermis covering scutum and tergum is very persistent and of a golden-yellowish colour; it is covered, especially along the occludent margins of both valves, with numerous long and rather stiff chitinous hairs of yellowish-golden colour.

The study of the animal's body yielded the following results:

Mouth. Labrum (Pl. XIX, fig. 2) with shallow notch, the margin of which is thickened, especially at the bottom. Three strong teeth on each side. Outer margin of lateral parts nearly straight, and furnished with very delicate hairs or ciliae.

Palpi: elongately-oval with the superior margin straight, and the inferior strongly curved. Long hairs on outer surface distributed over large part of surface, near the free extremity and along the inferior margin. Hairs on superior margin numerous, slightly increasing in length towards the free extremity. Hairs on inner surface disposed in a row which is parallel to the superior margin, and at a short distance from it, curling over free edge of labrum, when the palpus is not uplifted.

Mandible (Pl. XIX, fig. 3): distance between extremities of teeth 1 and 2 greater than that between 2 and 3. Tooth 3 thick, 4 distinct and double, 5 together with inferior angle represented by three short spine-like teeth, the last of which is somewhat longer. Hairs along inferior margin few, rather long. (The first of the three short spine-like teeth in some specimens is somewhat stronger, and represents in that case, tooth 5).

Maxilla (Pl. XIX, fig. 4 and 4*): with a broad notch behind the upper pair of spines. The remaining part of the edge forms an indistinct step-like projection and is furnished with 4 to 5 somewhat shorter and narrower, and 2 longer spines of about the same length as those of the upper pair.

Outer maxillae (Pl. XIX, fig. 5): the outer lobe short and broad, covered near the extremity with a tuft of — in comparison with other species — not very numerous hairs. A few hairs are disposed along a longitudinal line extending over the outer lobe towards the margin of the inner lobe. The latter has a somewhat quadrate form; towards the inner side it is furnished with not very numerous, but long and feathered hairs, which, most of them, point towards the basis of the maxilla.

Cirri. First pair has unequal rami of 6 and 10 segments. The segments of the shorter ramus have rounded protuberances covered with hairs; the segments 3—6 of the longer ramus show only indistinct protuberances.

Second pair has the rami slightly unequal only of 6 to 7, and 7 to 8 segments; segments with somewhat rounded inner faces, hardly protuberant, on which rather dense tufts of hairs are disposed.

Third pair has 8 and 9 segments in the two rami, tufts of hairs disposed on the rounded inner face near the extremity; hairs less dense on the lower segments of the longer ramus. No teeth to be seen along the inner faces of the segments.

Fourth pair has 13 and 15 segments in the two rami; the greatest number of spines on the inner face of the segments is 4 pairs.

Sixth pair (Pl. XIX, fig. 6) with 17 and 18 segments in the two rami; the greatest number of spines on the inner face of the segments is 5 pairs.

Penis long, tapering towards the extremity. Numerous hairs scattered over surface; a tuft of rather long and numerous hairs is situated at and near the extremity.

This species was dredged by the Siboga at:

Stat. 136. Between July 29 and August 3. Ternate-anchorage. Depth 27 m. Bottom: mud and stone. Numerous specimens on the surface of pieces of rock.

To the same species probably belong two very small specimens (Pl. XIX, fig. 7) which were dredged at:

Stat. 260. December 16 and 18, 1899. Lat. 5° 36'.5 S., Long. 132° 55'.2 E. N.W. from the North-point of Nuhu Jaan, Kei-islands. Depth 90 m. Bottom: sand, coral, and shells.

13. *Balanus ciliatus* n. sp. Pl. XIX, fig. 8—16.

Parietes, radii and basis without pores. Basis calcareous. Radii broad, summits oblique

in varying degree, coloured orange. Shell light-reddish, partly white, with vertical red stripes. Surface of compartments furrowed. Scutum with the apex sharply pointed, articular ridge not prominent, adductor ridge hardly visible. Tergum with a prominent articular ridge and a broad spur with rounded extremity. Labrum with three teeth on each side of notch; palpi with ciliae in groups along inferior margin.

The specimens are covered by a sponge-like coat. The shape of the shell is conical, in younger specimens more globular. All have the orifice rather large (Pl. XIX, fig. 8), the radii broad, with their summits oblique, slightly oblique, or even, in one of the specimens, quite parallel to the basis; the summits of the alae are rounded. The colour of the shell is dirty-white, striped longitudinally and spotted here and there with red; the rostrum is in most specimens almost perfectly white. The radii are more or less distinctly orange-coloured. The compartments and the radii have no pores. In the lower part of the shell longitudinal ridges are found on the interior surface; these touch each other at several places and also close to the basis, which causes a transverse section to sometimes look as if pores were present. The basis has no pores; the longitudinal ribs of the inner surface of the shell can be followed on the basis, where they radiate from the centre.

The scutum (Fig. 9, *a* and *c*) is of a regular triangular shape, with the tergal margin as long as the basal margin, or even slightly longer; it is pointed towards the apex. Occludent margin indistinctly toothed, basal margin not strongly convex. Lines of growth rather numerous, not very prominent. Surface indistinctly striated longitudinally. On the inner surface, the articular ridge not prominent, sloping towards basi-tergal angle; adductor ridge hardly to be distinguished, represented by a slight uplifting only of the internal surface. A small and shallow pit for the lateral depressor muscle and an indication only of the cavity for the adductor muscle.

The tergum (Fig. 9, *b* and *d*) has the apex not produced; the carinal margin is rounded, the scutal margin straight. The longitudinal furrow is represented by a slight depression, the spur is situated at a little distance from the basi-scutal angle; it is not very long and its width, measured at the height of the basal margin, is about two-fifths of the length of that margin. Its lower end is rounded; the basal margin makes an angle with the posterior margin of the spur. The articular ridge is prominent and the crests for the depressores are well-developed. On the inner surface a triangular part of the surface situated at the apex of the valve, is distinctly striated transversely.

With regard to the structure of the animal's body the following may be said:

Mouth. Labrum (Pl. XIX, fig. 10). Notch wide at entrance, three teeth on each side. In the specimen from Stat. 299 one tooth is situated half way along the margin of the notch, and one tooth is wanting at one side. Delicate hairs disposed along notch and between teeth 1 and 2.

Palpus: broad, stout, somewhat quadrangular, with the superior margin nearly straight and the inferior one arched. Hairs along superior margin numerous, but situated at some distance from each other. They combine near free extremity with the very numerous and longer hairs disposed on distal part of outer surface. A relatively large part of outer surface is covered with hairs. The inner surface bears a longitudinal group of shorter and curled hairs situated close together, the same sort of hairs being also seen on the part of the inner surface between that

longitudinal group and the superior margin. The inner surface near the free extremity, and the inferior margin, are furnished with microscopical hairs or ciliae. The latter stand in distinct little groups or bushes, especially in the specimen from Strait Molo.

Mandible (Pl. XIX, fig. 11): teeth 1 and 2 pointed, their extremities at somewhat greater distance from each other than those of 2 and 3. Teeth 2 and 3 distinctly double. Tooth 3 thick. Teeth 4 and 5 close together, rather thick. Inferior angle terminating in two small, pointed spines, or rudimentary teeth. In the specimen from Strait Molo, teeth 4 and 5 are less distinctly developed, tooth 5 being confused with inferior angle. The latter bears no spines or rudimentary teeth.

Maxilla (Pl. XIX, fig. 12 and 12*): Notch small. The inferior pair of longer spines situated on an indistinct step-like projection in the larger (older) specimen only. A group of smaller spines is situated on the edge behind the inferior pair of larger spines. Between the small notch and the inferior pair of spines 5 spines are arranged in a single row and alternately point with their extremities to one or the other side.

Outer maxillae (Pl. XIX, fig. 13): Outer lobe broad at the basis, the exterior circumference regularly rounded, and the apex somewhat pointed. Hairs on distal part numerous and delicate; the row of hairs extending from the outer lobe to the inner one partly double, these hairs standing off horizontally. Hairs on inner lobe not numerous, but disposed in several rows; a group of short spine-like hairs under and behind the longer feathered ones.

Cirri: First pair. Rami unequal of 7 to 9, and 14 segments. The three lower segments of the shorter ramus fused together. Middle segments distinctly protuberant, protuberances covered with dense bushes of hairs. Six inferior segments of longer ramus shorter than broad, segments 7—9 quadrate, and 10—14 longer than broad. In the specimen from Strait Molo, the lower segment of the shorter ramus consists of only two segments, the whole number being 8 to 9 in consequence. The longer ramus has three segments more: 17 in all.

Second pair. Shorter ramus has 7 segments, the basal one consisting of three segments. Longer ramus has 9 segments. All the segments furnished with dense groups of spine-like hairs situated on rounded protuberances. In the specimen from Strait Molo the number of segments is 10 and 11; here the spine-like hairs are extremely numerous, feathered, and arranged very densely.

Third pair. Number of segments 11 and 12, 11 in the shorter and 13 in the longer ramus in the specimen from Strait Molo. Bushes of hairs on the protuberances of the segments not so dense as on second cirrus. These protuberances (Pl. XIX, fig. 14) are furnished with quite a row of small recurved teeth, with the exception of only the last three segments in the shorter, and the last in the longer ramus. The teeth on the protuberances are partly recurved; about half of them are short and spine-like.

Fourth pair. Dorsal margin of basal segment of one ramus furnished with a double row of short tooth-like spines, such spines being seen also on the dorsal margin near the extremity of the 2nd segment. Inner face of 2nd—6th segments furnished along and near the margin with numerous but small recurved teeth (Pl. XIX, fig. 15) arranged in small groups along a longitudinal row of slightly stronger teeth; a few more of these are seen on 7th to 10th segments.

Hair-like spines disposed on the outer face near the extremity of the segments, and are unusually long and stout. In this specimen the tips of the rami of this cirrus were broken off, hence the number of segments is uncertain. The specimen from Strait Molo had 16 to 17, and 19 to 20 segments in the two rami. On outer face near the extremity, groups of 4 to 5 spines are disposed, two of which are very stout. On the inner face short, strong, tooth-like spines form groups at the basis of the longest pair of spines, on segments 2—14 of the one, and 2—12 of the other cirrus, but on the shorter ramus only.

Fifth pair (broken off in the specimen from Station 299) has nearly equal rami of 19 and 20 segments in the specimen from Strait Molo.

Sixth pair: Rami of 21 and 22 segments. Basal segments quadrate, middle segments twice as long as broad, distal segments longer still. Number of pairs of spines on inner face of segments as a rule 4; very exceptionally a 5th pair is seen (Pl. XIX, fig. 16). Hairs on outer face near extremity long and stout. In the specimen from Strait Molo one ramus has 24 segments, the other is broken off; all the segments, without exception, furnished with 4 pairs of spines on their inner face.

Penis not very long in the specimen from Station 299, much longer in that from Strait Molo. The basal or supporting part bears dorsally an excrescence that is not pointed however, but blunt at the extremity. The penis is somewhat tapering towards the extremity, and here is furnished with slightly stronger hairs, placed in two diverging groups.

This species was collected by H. M. S. "Siboga" at the following places:

Stat. 51. April 19, 1899. Strait Molo. Depth between 69 and 91 m. Bottom: fine grey sand or coarse sand with shells and stones. One somewhat larger specimen.

Stat. 299. Lat. 10° 52′.4 S., Long. 123° 1′.1 E. Buka- or Cyrus-bay, South-coast of Rotti-island. Depth 34 m. Bottom: mud, coral, and Lithothamnium. Half a dozen medium-sized specimens.

Stat. 305. Mid-channel in Solor-strait off Kampong Menanga. Depth 113 m. Bottom: stony. Four small specimens, with calcareous basis, covered with sponge-like coat; surface with longitudinal stripes. (Determination not quite certain, as the opercular valves are wanting).

14. *Balanus compressus* n. sp. Pl. XIX, fig. 17. Pl. XX. fig. 1—7.

Surface of shell smooth, orifice large, distinctly toothed. Radii broad with the summits very obligue, alae also broad with convex surfaces. Scutum with the articular ridge not prominent and without adductor ridge. Tergum elongate, placed very close to the basi-scutal angle. Opercular valves covered with short hairs, more distinctly so along occludent margin. Labrum with four teeth on each side of notch; outer surface of palpus covered with hairs over a large part.

The most typical example of this species is characterised by a large orifice, which is toothed (Pl. XIX, fig. 17) in consequence of the shape of the upper extremities of the compartments. The shell is somewhat globular, but flattened laterally, being attached to a rather narrow object, the tube of an Annelid; the surface is smooth, without ribs or ridges. The shell has a light reddish colour, but is beautifully striated with darker red longitudinal lines. The radii

have the summits very oblique and straight or slightly hollowed out, they are horizontally striated and broadest a little above the middle, growing narrower again towards the inferior extremity. The alae have the summits rounded (specimen from Station 204). Parietes not permeated, radii without pores. Basis calcareous.

The other specimens (from Station 289) are smaller and coloured white, or yellowish in consequence of adhering mud. They have the large and toothed orifice of the larger specimen, and the shape of radii and alae are the same. The opercular valves closely resemble those of the specimen from Station 204.

The scutum (Pl. XX, fig. 1, *a* and *c*) has the occludent margin somewhat convex towards the apex; its tergal margin is slightly hollowed out, and its basal margin is undulating. The ridges of growth on the outer surface are very feeble. On the inner surface the articular ridge is not prominent, its margin runs parallel to the tergal margin and extends almost to the basi-tergal angle. There is a shallow depression for the lateral depressor muscle, and a slight trace of an adductor ridge parallel to the articular ridge.

The tergum (Pl. XX, fig. 1, *b* and *d*) is narrow, elongated in the direction from the apex towards the tip of the spur. Its carinal margin is convex, its scutal margin almost straight, its basal margin makes only a very feeble angle with the posterior margin of the spur. The outer surface shows a very shallow depression at the place of the longitudinal furrow. The spur is placed close to the basi-scutal angle, its freely-extending part is not very long, it is about one third of the width of the valve. On the inner surface the articular ridge is separated from the scutal margin by a broad furrow; the crests for the depressores are distinct but short.

The epidermis covering scutum and tergum is slightly more persistent than in other species and bears very short yellowish hairs over the whole surface of the valves; they are disposed somewhat more densely along the opercular margins of these valves.

With regard to the structure of the animal's body the following is of interest:

Mouth. Labrum (Pl. XX, fig. 2) has a shallow notch and four larger teeth on each side of it. The notch is very wide at the entrance, the margin of the lateral parts is horizontal and quite straight.

Palpi are not very broad, elongately-oval. The free extremity is distinctly rounded, superior margin nearly straight, the inferior distinctly arched. The superior margin bears a continuous row of hairs, which grow longer towards the free extremity. A large part of the outer surface which extends along the inferior margin to half way the length of the palpus, is covered with rather long hairs. The hairs on the inner surface, near the superior margin, are reflected; most of them are short, bent downwards and feathered.

Mandible (Pl. XX, fig. 3 and 3*): distance between extremities of teeth 1 and 2 and that between 2 and 3 nearly equal; 2nd and 3rd teeth indistinctly double. Third tooth blunt, fourth not so strong, but with rudimentary additional tooth. The part behind the 4th tooth not much developed: at one side the whole inferior part consists of a few, nearly equally strong, flat teeth, at the other side, a rudimentary 5th tooth and two flat spines, the second of which is long and sharp can be readily distinguished.

Maxilla (Pl. XX, fig. 4): somewhat elongate; a small notch beneath the upper pair

of spines, then 4 spines, and on the maxilla of the other side 5 somewhat shorter spines, then two longer ones of the same size as those of the upper pair. The base of the middle-spines slightly overlap each other, these spines giving, in consequence, the impression of standing in two rows. The superior and inferior margins nearly parallel to each other.

Outer maxillae (Pl. XX, fig. 5): the outer lobe of trapezoidal form, the triangular distal part being about the only one which is covered with hairs. Few hairs only form the longitudinal row which runs from the outer to the inner lobe. The latter has a rounded surface, and bears not very numerous feathered hairs along the inner and inferior margins.

Note. The description of the parts of the mouth given above is for the specimen from Station 204. In one of the specimens from Station 289 the difference between the distances of teeth 1 and 2, and 2 and 3 of the mandibles is greater, and tooth 4 is not developed in the mandible of the right side. The maxillae have 3 and 4 middle-spines; the outer maxillae have the outer lobe somewhat shorter and broader, and the hairs disposed towards the inner lobe are less numerous.

Cirri. First pair. The cirrus of the one side has 7 and 11, that of the other 7 and 12 segments; the inner face of the segments is rounded, but cannot be said to be protuberant.

Second pair has nearly equal rami of 8 and 10 segments.

Third pair has 10 and 11 segments in the two rami. Segments 2—9 (Pl. XX, fig. 6) of the longer ramus, and 3—8 of the shorter bear well-developed groups of small, straight, and not recurved, triangular teeth along the inner face and between the spines on the distal half of that face. The teeth are situated on the face of the segments and at a little distance from the margin.

Fourth-sixth pairs. Number of segments slightly increases from the 4th to the 6th pair; the greatest number is not much over 20. Pairs of spines disposed on the inner face of the segments of the 4th cirrus, four only; on some of the segments of the 5th cirrus and on most of the 6th (Pl. XX, fig. 7) this number, however, is five. The middle segments are twice as long as broad, the basal ones shorter, the distal ones longer; the very last one is, however, short and slender.

Note. The cirri of the specimen from Station 289 correspond in general with this description. The number of segments, however, is smaller: the first cirrus has 5 to 6 and 10 segments, the second 7 and 8, the third 8 and 9, the fourth 16 and the sixth 19 segments. The teeth on the protuberant parts of the middle segments of the longer ramus of the 3rd cirrus are present — but they are very small. Three or four segments only of the 6th cirrus have 5 pairs of spines on their inner faces, all the others have at the most 4 pairs.

Penis long, curled; few hairs only scattered over the surface, a little tuft of hairs situated at the extremity.

This species was dredged by H. M. S. "Siboga" at two different Stations:

Stat. 204. Sept. 20, 1899. Lat. 4° 20′ S., Long. 122° 58′ E. Between islands of Wowoni and Buton; Northern entrance of Buton-strait. Depth from 75—94 m. Bottom: sand with dead shells. The *Balanus* is attached to the tube of an Annelid.

Stat. 289. January 20, 1900. Lat. 9° 0′.3 S., Long. 126° 24′.5 E. Depth 112 m. Bottom: mud, sand and shells. Group of 3 to 4 small specimens.

General Remarks: The specimens from the two stations correspond sufficiently to consider them as belonging to the same species. In minute details of size and colour, and in less important points of the structure of the animal's body, the correspondence, perhaps, is not complete; yet it is certainly great enough to put them together. Should the species, which, though not a true deep-sea species, inhabits deeper water (of about 100 m.), be collected again, so that richer material can be investigated, its relations with other species will have to be settled. With the present material this could not be done in a satisfactory way.

5. Sectio: **Membrano-Balanus**

15. *Balanus longirostrum* n. sp. Pl. XX, fig. 8—16.

Shell quite imbedded in a sponge; parietes solid; basis membranous; rostrum twice as long as carina, with the basal part narrow, and a longitudinal furrow over its whole length. Carino-lateral compartments very narrow. Scutum with two longitudinal folds. Tergum with the spur broad.

This species is nearly related to *Balanus declivis* Darwin from the West-Indies. Paying special attention to the little differences I found between this form from the Malay Archipelago and Darwin's description and figures, I thought better to describe the Siboga-species as new, although convinced that, in several respects, it corresponds with the West-Indian form.

The shell (Pl. XX, fig. 8) is thin, brittle, smooth and white; the membrane which covers *B. declivis* is not, or not so well-developed in the present species: only small parts of it are observed round the orifice; no bristles are seen clothing this membrane. The parietes are not porose, they are delicately striated longitudinally, much more distinctly in horizontal direction. The orifice is large and irregularly toothed. The carina and the rostrum are both strongly bowed; but, while the carina is only a trifle longer than the lateral compartments, the rostrum (Pl. XX, fig. 9) is about twice as long, the basal part extending far beyond the basal margin of the other compartments. This basal part is broader upwards, grows narrow downwards and terminates almost in a point. The exterior surface of the rostrum is longitudinally grooved by a furrow which extends almost to the pointed basis. The alae are broader and horizontally striated in the same way as the compartments; the radii are narrow, their summits are somewhat oblique, their sutural edges smooth. The carino-lateral segments are about the same length as the lateral compartments, which, however, are three times as broad as the former. One of the larger specimens I have examined has a basal diameter of about 4 mm. and a height of $2^1/_4$ mm. The length of the rostrum of this specimen was over 5 mm.

The scutum (Pl. XX, fig. 10, *a* and *c*) is distinctly convex, with very narrow lines of growth, very feebly crenated, so as to produce a hardly visible longitudinal striation. It shows two longitudinal furrows dividing it indistinctly into a broader middle, and two narrower lateral parts. On the inner surface there is no adductor ridge, and the articular ridge is moderately developed, broadest in the middle and sloping towards the inferior extremity. The pit for the depressor muscle can hardly be distinguished.

The tergum (Pl. XX, fig. 10, *b* and *d*) is beaked, with the scutal margin straight. The external surface shows distinct growth-ridges. The spur is situated close to the basi-scutal

angle and is of considerable breadth. The basal margin is slightly hollowed out, and no crests for the depressor muscles could be seen.

The structure of the animal's body shows the following peculiarities:

Mouth. Labrum (Pl. XX, fig. 11) with the notch wide at entrance and not very deep. The outer edge of the lateral parts rounded. Two teeth on each side of notch, short delicate hairs disposed along the edge. The whole shape of the thickened portion of the labrum more rhombiform than triangular.

Palpi elongate with distal extremity slightly turned up, hence the superior margin is somewhat hollowed out. Hairs numerous and delicate: a dense row of shorter ones along superior margin, and a great number of longer hairs scattered irregularly over outer surface.

Mandible (Pl. XX, fig. 12) with three well-developed teeth, and teeth 4 and 5 and inferior angle blunt and almost rudimentary. Distance between extremities of teeth 1 and 2 slightly longer than that between 2 and 3. Half way between the latter two teeth in both mandibulae a small additional tooth is observed. The inferior angle, which in the mandible of the one side ends bluntly, terminates into a short spine in the other.

Maxilla (Pl. XX, fig. 13 and 13*) has the free edge straight, a small notch under upper pair of spines, and 5 spines on the middle portion of the edge between the notch and the slightly longer inferior pair. Differences in length of the spines not very considerable.

Outer maxilla (Pl. XX, fig. 14) with the outer lobe of oval shape, the inner and outer margins rounded equally strongly. On the outer half of the inner surface this lobe is covered with numerous delicate hairs; while the other species have a single or double row of hairs, extending from the outer to the inner lobe, quite a broad group of numerous hairs is seen in this species. Inner lobe rounded, with longer hairs disposed as usual along inner margin.

Cirri. First pair has the two rami very unequal of 8 and 20 segments respectively. The segments of the shorter ramus very protuberant on the anterior face.

Second pair has the rami slightly unequal of 10 (11) and 12 segments. The segments are rounded, not protuberant, on their anterior faces. Hairs on different segments numerous, they do not form, however, such dense tufts as on the same cirrus of most other species of *Balanus*. On all the segments, of the outer as well as of the inner ramus, with the exception of the last segment, on the distal half of the exterior face, rows of small spine-like teeth are seen. These are of a peculiar form, and look like rounded scales bearing one, two, or three sharp spines on their margins.

Third pair has unequal rami of 12 and 15 segments. Similar, but slightly stronger rounded scales with small teeth on the margin, as on the second cirrus, form several transverse rows on the distal half and outer surface of the 8 to 9 lower segments of both rami. Anterior margin developed into a rounded protuberance.

The fourth pair has the rami slightly unequal, of 19 and 21 segments. Triangular spine-like teeth (Pl. XX, fig. 15 and 15*), stronger than the corresponding ones on the 2nd and 3rd cirri, form transverse comb-like rows and are disposed on both segments of the pedicel, near the extremity, and on about 10 of the lower segments of the outer ramus of this cirrus. They are also seen on the other ramus, but there they are much less strong.

The fifth and sixth pairs are nearly equal. They have respectively 25 and 26, and 26 and 28 segments in the two rami. The anterior face of most segments is furnished with four pairs of hairs (Pl. XX, fig. 16): one pair (the most distal one) is longer, the second is already much shorter, the third is short, the fourth extremely minute.

Penis long, longer than the cirri. Surface covered with numerous hairs, on the distal part especially. Hairs standing off transversely in a peculiar way. No sharp point observed dorsally on the basal part of the penis.

This species was discovered by Dr. G. C. J. Vosmaer in Sponges belonging to the species *Spirastrella purpurea* (Lmk.) Rdl., dredged at the following Stations:

Stat. 86. June 18/19, 1899. Anchorage off Dongola, Palos-bay, Celebes. Depth 36 m. Bottom: fine grey mud (river mud).

Stat. 313. February 14/16, 1900. Anchorage East of Dangar Besar, Saleh- (or Sapeh-)bay. Depth up to 36 m. Bottom: sand, coral and mud.

General Remarks. This species occurs in numerous specimens in the sponges it inhabits and will also be found, most probably, at other places in the Archipelago. Weltner (Verzeichniss, 1897, p. 270) mentions *B. declivis* Darwin as collected by Martens at Batjan (Molucca's), but I think it possible and even probable that it was not Darwin's species but the species here described. I think the difference in shape of rostrum and scutum, and, moreover, the narrowness of the carinal-latus, of sufficient importance for not considering the species of the West-Indies and that of the East-Indian Archipelago as identical, however nearly related they may be. I think that the Siboga-species differs also from Pilsbry's *B. orcutti* which was described (Pilsbry, Henry A., Notes on some Pacific Cirripedes. Proceed. Acad. of Sci. Philadelphia, 1907, p. 361), on specimens from San Ysidro, Lower California, and which Pilsbry considers as differing from *B. declivis* Darwin of the West Indies. The shape of the opercular valves, and that of the rostrum of Pilsbry's species, is certainly different from that of the same parts in my species. The three species, however, are no doubt nearly related: they may be found to be local forms of the same species after all.

Darwin considered his *B. declivis* as belonging to the section E (species with membranous basis). I pointed out, under the head of the Genus *Balanus*, that I consider this classification as more or less artificial. If we take into consideration, not one special character of the forms, but their whole structure — the shell as well as the animal itself — we can come to another arrangement of the species, and one which, perhaps, gives a better idea of their affinities, so far we can judge at present.

6. Sectio: **Armato-Balanus**

16. *Balanus terebratus* Darwin. Pl. XX, fig. 17—21. Pl. XXI, fig. 1—3.

Darwin, Ch., Monograph. Balanidae and Verrucidae. 1854, p. 285, pl. 8, fig. 2*a*—2*b*.

Darwin gave a description of this species and proposed a name for it, without being able to examine the opercular valves; but, he said, the species here named is so peculiar that it would have been a fault to pass it over. There is but a single specimen in the

British Museum, DARWIN continued, and this without the operculum, as just stated, and, of course, without the animal's body.

Since this was written, the species was mentioned in two papers: in BORRADAILE's Marine Crustaceans of the Maldive and Laccadive Archipelagoes (1903), and in ANNANDALE's Cirripedia, in the "Ceylon Pearl Oyster Report" (1906). BORRADAILE, however, was unable to find in his specimens the rows of holes between the ridges of the basis as described by DARWIN and, therefore, thinks it possible that his species is different from DARWIN's. He gave a short description of the opercular valves of his species. ANNANDALE says about the species he has investigated that it agrees closely with BORRADAILE's description as regards the structure of the operculum; as for the apertures of the basis, which BORRADAILE was unable to see, ANNANDALE reports that they are absent in some samples he has examined. "In one individual, however, there appear to be indications that they have been present, but have been almost obliterated during growth".

Of course, it is possible that something of the kind has happened in the case of the specimens from the Gulf of Manaar — all I can say is, that the Siboga dredged several specimens of *Balanus* which no doubt belong to DARWIN's species, and the basis of which distinctly shows the remarkable structure mentioned by that author. The description of the opercular valves given by BORRADAILE, although agreeing in several respects with that of the Siboga specimens, is too short to be absolutely decisive. Yet, what BORRADAILE says about the tergum: "Apical tooth present, but broken in the specimen" seems to prove that his determination is right.

The Siboga-specimens have the shell (Pl. XX, fig. 17) white and strongly ribbed longitudinally; the ribs near the basis are produced into points or spikes, which correspond with such spikes at the circumference of the basis. The length of these spikes in the Siboga-specimens is, perhaps, not quite so great at it was in the specimen studied by DARWIN. The shape of the shell is conical, somewhat elongate in its rostro-carinal axis. The orifice is small, pentagonal, toothed. The radii are narrow and have oblique summits. The carino-lateral compartments are narrow.

The basis is distinctly concave and has the circumference produced into spikes as already mentioned. The internal surface has slightly prominent ribs radiating from the centre to the surface, and between these, rows of small openings are seen. These apertures are of somewhat irregular shape and unequal sizes; they are mostly placed in a single row, here and there, however, in an irregular double row. The shell is almost entirely covered by a thick yellowish coat which seems to be a sponge; the ribbed structure appears distinctly only after this has been taken away. The size of the shells in the larger specimens is: $3^1/_2$ mm. greatest diameter of the basis, and a height of $2^1/_4$ mm.

The scutum (Pl. XX, fig. 18, *a* and *c*) has prominent growth-ridges, terminating at the occludent margin in very prominent teeth. In larger specimens the upper part of the outer surface does not show these ridges so distinctly, nor are the teeth of the occludent margin so prominent here. At the inner side, the articular ridge is long but not very prominent; the adductor ridge is well-developed. At the basi-tergal corner there is a well-marked cavity for the lateral depressor muscle.

The tergum (Pl. XX, fig. 18, *b* and *d*, fig. 18*) has a rather broad spur, the anterior margin of which is separated from the basi-scutal angle by a minute part of the basal margin; in other specimens it is confluent with the scutal margin. The remaining larger part of the basal margin is distinctly hollowed out. The scutal margin is nearly straight, the carinal margin not very long. These two margins meet at the apex, which is produced into a sharp spine-like beak. This spine-like beak, however, is a yellowish chitinous structure that is kept in its place by means of the chitinous membrane covering the whole valve. If the valve is boiled with caustic potash this chitinous beak separates from the calcareous valve. (I suppose this is the structure meant by BORRADAILE when he says that (at the tergum) an apical tooth is present, but broken in the specimen).

Nothing was known hitherto about the structure of the animal's body, and I think it will be useful to give the following description:

Mouth. Labrum (Pl. XXI, fig. 1): notch rather deep, wide at entrance; lateral margins making together an angle, say of 135°, hence the thickened portion of the labrum, which in most species is sub-triangular, is in this species rhombiform, with its height only slightly shorter than its breadth. On each side of the notch three small teeth are seen, of which in one specimen, however, only two were developed; very short hairs are disposed along entrance of notch and between the teeth.

Palpi: oval, slightly recurved towards free extremity. Distal part a little narrower, but not pointed. Upper margin almost straight, slightly hollowed out; inferior margin convex. Hairs scattered over large part of outer surface, forming with some of those along upper margin a not very conspicuous tuft at the extremity. On inner surface numerous shorter hairs form a longitudinal group that is disposed at some distance from the upper margin and parallel to it.

Mandible (Pl. XX, fig. 19): extremities of teeth 1 and 2 a trifle farther distant from each other than 2 and 3. Tooth 2 double, 3 swollen, 4 small and triangular, 5 confluent with inferior angle, forming together a series of very small nobs. Inferior part only slightly developed. Surface with isolated hairs, and also with some hairs arranged in groups; shorter hairs and spine-like nobs on surface of inferior part.

Maxilla (Pl. XXI, fig. 2): edge long and almost absolutely straight; two spines near upper, two near inferior extremity of edge, the latter a trifle longer than the first. Between the two pairs, 7 spines are disposed. Hairs on surface are seen only near outer edge, those on superior margin as well as those along inferior margin very few only — 6 to 8.

Outer maxillae (Pl. XXI, fig. 3): outer lobe rather broad and not pointed towards extremity. Inner margin almost straight, outer margin rounded. Hairs scattered over inner surface perhaps not quite so numerous as in other species, a group, not a single row, descends from the outer to the inner lobe. Inner lobe elongate, furnished with numerous and partly very long and recurved hairs, the extremities of which are directed inwards and downwards.

Cirri. First pair has very unequal rami of 6 and 14 segments. Hairs at extremity of 6th segment of shorter ramus spine-like, slightly curved, strong and feathered.

Second pair has slightly unequal rami of 7 and 8 segments; shape of segments quadrate; last segments of both rami bear curved spine-like hairs on the extremity, much resembling those of the last segment of the shorter ramus of the 1st cirrus.

Third pair has rami of 8 and 10 segments respectively, which are somewhat more elongate than those of the 2nd cirrus. Pedicels also much longer. 3 or 4 lower segments of longer ramus with a few tooth-like spines disposed along anterior face near distal extremity of segments.

Fourth pair has also unequal rami of respectively 16, 17 and 20 segments. The lower segments 1—7 of the shorter ramus (Pl. XX, fig. 20), bear from 2 to 5 curved teeth at the anterior face, those situated near distal extremity being the longest, the others smaller, decreasing in size towards the base of each segment. Most segments, to begin with the 2nd, bear two to three pairs of spines, two of these pairs close together near distal extremity, and the third at some distance along the anterior margin. Hairs on posterior face of segments disposed at the distal extremity, rather long, especially those on the lower segments. Last segment of pedicel without any teeth along anterior face.

Fifth and sixth cirrus nearly equal, the sixth has one or two segments more in each ramus. In one of the specimens 26 and 30 segments were counted in the 6th cirrus. Length of segments increases from the basis towards the extremity: the last segments are nearly four times as long as broad. The anterior face of most segments bears three pairs of hairs (Pl. XX, fig. 21): the longest near the extremity, the third pair extremely minute about the middle of the anterior face, and the second pair, which is not very long, half-way between the two other pairs. The hairs on the posterior face, near the extremity of the segments, are short in the distal segments, much longer on the basal segments.

Penis long, much longer than the cirri of the 6th pair, tapering towards the extremity, uncommonly hairy near and at the extremity.

Eggs with embryos: Nauplii with black eye-spots, in the mantle cavity. Size of the eggs 0.25 × 0.15 mm.

The specimens were taken at:

Stat. 257. December 11, 1899. In Duroa-strait, Kei-islands. Depth down to 52 m. Bottom: coral. A single group of half-a-dozen specimens, most of them overgrown by a sponge-like organism, the surface of which shows numerous short spines or needles.

17. *Balanus arcuatus* n. sp. Pl. XXI, fig. 4—14.

Shell conical, dirty white, with corroded surface in some, tinged with red and distinctly ribbed in other specimens. Radii broad, with their summits parallel to the basis. Orifice entire, elongately pentagonal. Carino-lateral compartments extremely narrow. Basis flat, not imbedded, not porose. Scutum with the lines of growth crenated; tergum with the spur broad and confluent with the basi-scutal angle, the apex of the valve distinctly produced and the scutal margin deeply hollowed out.

Numerous specimens are attached to both surfaces of calcareous plates of a polypoid character, some of them very close together, others at some distance from each other. General shape (Pl. XXI, fig. 4) of the shell flatly-conical, with the surface dirty white and more or less corroded in some, and distinctly ribbed and tinged with a more or less vivid red in other specimens. Ribs in that case white or coloured less distinctly, intervals between the

ribs coloured more distinctly and transversely dotted with darker red. Radii rather broad, not very distinct, however, in the specimens with corroded surface; coloured white or faintly reddish in the specimens with ribbed surface, and being transversely striated in these specimens, more distinctly so in the upper half. Orifice small, elongately pentagonal, nearly entire, certainly not toothed; the recurved tips of the terga occupy the carinal angle of the orifice in a very peculiar way. Together with the extreme narrowness of the carino-lateral compartments, causing the radii of these valves and those of the rostro-lateral compartments nearly to touch each another, the characteristic appearance of the tips of the terga will always make it easy to recognize this species.

Parietes (Pl. XXI, fig. 7, *a*, *b* and *c*) solid, no pores, but with well-developed longitudinal ribs, forming so many septa, which are denticulate in their basal parts. The sheath is transversely ribbed. The radii of the carino-lateral and rostro-lateral compartments nearly touch each another, owing to the extreme narrowness of the carino-lateral compartment (Pl. XXI, fig. 5). The sutural edges are coarsely ribbed transversely. The basis is thin, attached firmly to the surface of the calcareous plate and has no pores; it adheres very firmly to the walls of the valve and is perfectly flat — not cup-shaped, and not imbedded in the coral at all. Its interior surface shows delicate ridges radiating from the centre.

Greatest diameter of the basis of one of the larger specimens about 7 mm.

Scutum (Pl. XXI, fig. 6, *a* and *c*) the lines of growth are very distinct and are beset with a number of small points making them look as if crenated; occludent margin distinctly and more or less irregularly toothed; articular ridge not very prominent and extending down from the apex to about two thirds of the length of the tergal margin; adductor ridge indistinct; cavity for the lateral depressor muscle well-developed; along the tergal margin the surface of the valve is uplifted, the growth-ridges being here very distinctly crenated or toothed.

Tergum (Pl. XXI, fig. 6, *b* and *d*): apex distinctly produced, beaked, carinal margin convex, scutal margin strongly hollowed out, basal margin sinuous. Ridges of growth not very distinct, external surface almost flat, without a longitudinal furrow; spur situated quite close to the scutal angle of the valve, its extremity being almost confluent with that angle, not very short, and not quite half as broad as the valve itself. Crests for the depressor muscles indicated, but not very prominent. Articular ridge distinct only in the uppermost part of the valve. Tergum extremely brittle — it is difficult to prepare a really faultless specimen of it.

With regard to the structure of the animal's body the following may be of interest:

Mouth. Labrum (Pl. XXI, fig. 8): The outlines of the lateral parts of the labrum together make an angle; the notch is deep and not very wide at the entrance. Three well-developed and sharp teeth on each side of notch.

Palpi elongate, nearly oval, not club-shaped. Hairs along upper margin form a dense and regular row. Those on outer surface long, and placed in rows which make angles with the inferior margin near distal extremity. On the inner surface a longitudinal series of shorter hairs is disposed and this runs parallel to the upper margin, the hairs overlapping the edge of the labrum when the palpus is directed downwards. Extremely delicate ciliae are disposed along part of inferior margin and rounded distal margin.

Mandible (Pl. XXI, fig. 9): distance between extremities of teeth 1 and 2, and 2 and 3 nearly equal. Tooth 1 pointed, 2 and 3 double, 3 somewhat broader, 4 and 5 small, but distinct, inferior angle represented by a rudimentary nob. The hairs on the surface towards the inferior part go over into tooth-like nobs. Few hairs only along the inferior margin.

Maxilla (Pl. XXI, fig. 10): notch behind the two superior spines very distinct, and 5, sometimes 4 somewhat shorter spines, between the notch and the two inferior spines. The latter a trifle longer than the upper pair. Of the middle spines, the 4th is longer and thicker than the others.

Outer maxillae (Pl. XXI, fig. 11): outer lobe grows slightly narrower towards extremity and has the apex somewhat curved inwards, conseqently the interior margin is a little hollowed out. Surface partly covered with hairs. These hairs are disposed more densely towards distal extremity, where they form a kind of a tuft. Downwards, in the direction of the inner lobe, a very conspicuous row of hairs is seen, most of which stand off in horizontal direction. Inner lobe of oval shape, not much elongated; in one of the specimens its shape is hardly longer than broad. Hairs disposed on inner lobe not so numerous and not quite so long and stout as in most other species of the genus.

Cirri. First pair has unequal rami of 6 and 12 segments in one, 6 and 13 in another specimen. Segments cylindrical, hardly protuberant, those of the shorter ramus are slightly broader than those of the longer ramus.

Second pair has short rami of 5 and 7 segments respectively; segments not protuberant, but having the anterior face rounded; shape of segments as a whole almost circular. Tufts of hairs along rounded anterior faces not very dense.

Third pair has somewhat longer rami of 6 to 7, and 8 segments, each segment being about one and a half times as long as broad. The anterior face of the segments swollen and bearing along that swelling or protuberance (Pl. XXI, fig. 12) a row of teeth, which from the base to the upper end increase in size. These rows of teeth are present along segments 2 to 5 in the one, and segments 2 to 6 in the other ramus; near the upper margin of the segments each row ends in a curious minute comb formed by a horizontal row of very small teeth. Last segment of pedicel shows very minute teeth along anterior margin, near the extremity.

Fourth pair has rami of 14 and 16 rather elongate segments; last segment of pedicel quite unarmed; the anterior face of the middle segments of the shorter ramus bears only two pairs of spine-like hairs, the lower segments have only one pair and a pair of much shorter hairs; the anterior face of the latter segments (Pl. XXI, fig. 13), near the distal extremity, is furnished, moreover, with 2 to 3 somewhat recurved teeth. The middle segments of the longer ramus always have three pairs of such spine-like hairs. None of the segments of the longer ramus are furnished with teeth.

Fifth pair has 20 rather long segments in each ramus and, in the middle of the ramus, each segment furnished with 4 pairs of hairs on anterior face.

Sixth pair has 21 and 23 long segments in the two rami, and 4 pairs of hairs on anterior face of the middle segments (Pl. XXI, fig. 14). The first segment of the pedicel of this cirrus has the posterior margin distinctly serrated.

Penis much longer in the one than in the other specimen. In both it tapers very considerably towards the extremity and it is furnished with only very few hairs. No point observed on the dorsal side near the basis.

This species was collected at Banda at a depth of 9—36 m. The specimens are numerous, and are attached to pieces of stone, probably of Madreporian origin. To one of these stones a piece of a rather thick membranous coat, containing numerous polyps, is still attached; the *Balani*, however, are found only on the surface of the calcareous mass, where this membrane is wanting. Some specimens show the structure of the shell, its colours, etc., as described, but others have the surface uniformly white, or look as if their surface was corroded and then resemble more or less the stoney matter to which they are attached. To one of these pieces of stone a specimen of *B. amphitrite* was also found attached, and another specimen of the latter species almost completely overgrows one of the specimens of *B. arcuatus*.

General Remarks. I think that this species is in general related to several species of my group. Yet it has in other respects — in the narrowness of the carino-lateral compartments, in the shape of the tergum, in the structure of the radii, etc., — much that is peculiar to it. It comes near to *B. allium* Darwin: I have been long doubting, whether it did not belong to that species. I finished with considering it as distinct, not so much because the basis of my species is perfectly flat — the basis of *B. allium* according to Darwin is concave, can be more or less cup-formed, and is more or less deeply imbedded in the coral — but for the very peculiar shape of the tergum in the Banda specimens. The very striking impression which the orifice with the white beaks of the terga makes would certainly have been noticed by Darwin, and in his description of *B. allium* he merely says, "Tergum with the apex somewhat produced or beaked". What Darwin reports on the structure of the mouth and the cirri corresponds fairly well to what is seen in my new species — there are differences, however, which make it more probable that the two forms are nearly related, than that they will prove to be identical.

18. *Balanus quadrivittatus* Darwin. Pl. XXI, fig. 15—20. Pl. XXII, fig. 1—2.

Darwin, Ch., Monograph. Balanidae, Verrucidae etc. 1854, p. 284, pl. VIII, fig. 1.

At Station 164, attached to stones, together with specimens of *B. socialis*, small specimens of a *Balanus* were collected, which turned out to belong to the above-named species.

In general the Siboga-specimens agree with Darwin's description of this species. The shell is conical (Pl. XXI, fig. 15), somewhat depressed, with a small irregularly rhomboidal or sometimes pentagonal orifice. The surface of the shell shows longitudinal folds extending from the orifice to the margin of the base. The radii are narrow and have oblique summits. Colour dirty white, surface covered, however, with a layer of yellowish mud. Some of the specimens — not all — show, on rostrum, carina and latera, the four brownish-grey bands, which suggested to Darwin the present name of the species. I saw other specimens without a trace of these bands. The basis is very thin, calcareous, brittle — I could not discover pores, either in the basis, or in the compartments or radii. The basal diameter of one of the larger specimens was at the most 3 mm.

The scutum (Pl. XXI, fig. 16, *a* and *c*) has distinct, but smooth lines of growth, a well-developed articular ridge which is broadest in the middle and slopes towards the lower extremity, and no adductor ridge. The cavity for the adductor muscle is slightly indicated. Basi-tergal angle rounded.

The tergum (Pl. XXI, fig. 16, *b* and *d*) has the apex produced into a minute, sharp point; scutal margin straight, spur broad; its anterior margin makes a hardly visible angle with the scutal margin. The chitinous membrane which covers this valve bears quite a row of small yellowish hairs along the carinal margin of the tergum.

The very short remarks DARWIN made regarding the structure of the animal's body may be completed with the following:

Mouth. Labrum (Pl. XXI, fig. 17): notch deep and narrow, not very wide at entrance. Lateral margins forming an angle of about 90° with each other and a sharp angle with the margin of the notch. Teeth small; in both the specimens examined by me, the sharp angle formed by lateral margin and margin of the notch terminates, on both sides, in a sharp tooth, a second one being situated close to the first in one specimen, and at a little distance from it in the other. In the latter specimen a few more rudimentary teeth can be distinguished. A small tuft of very short hairs is seen immediately below the larger tooth along the upper part of the margin of the notch. Shape of thickened portion of labrum almost rhombiform, its height corresponding with its breadth.

Palpi: elongate with the distal part growing narrower, and the extremity almost pointed. Inferior margin only feebly convex, upper margin almost straight. A few longer hairs only are scattered over inferior half of outer surface of the palpus, a dense row of shorter hairs is disposed along upper margin and over inner surface, especially over its superior half.

Mandible (Pl. XXI, fig. 18): distance between extremities of teeth 1 and 2 a little longer than that between teeth 2 and 3. Tooth 3 slightly thicker; teeth 2 and 3 indistinctly double. Teeth 4 and 5 small but distinct; inferior angle terminates into 3 or 4 flat, short, narrow, spine-like teeth.

Maxilla (Pl. XXI, fig. 19 and 19*): edge rather broad, shape of whole maxilla triangular, pointed towards the extremity, where the place of attachment of the apodeme is found. Upper pair of spines shorter than inferior pair. Between these pairs, 3 to 5 somewhat shorter spines are disposed. Between the two spines at the basis a very small and narrow notch is always observable. The notch behind the upper pair is small, yet distinct. (The one specimen has 3 and 3, the other 4 and 5 intermediate spines).

Outer maxillae (Pl. XXI, fig. 20): have the outer lobe rather broad and quadrate, with the upper extremity obliquely truncated, the lateral margins almost parallel. A large part of the inner surface covered with hairs, most of which are directed in a direction at right angles to the length of the maxilla. Inner lobe club-shaped, with the narrow part directed downwards. Surface furnished with few, inner margin with not very numerous and somewhat longer hairs, the strongest of which are directed to the basis of the maxilla.

Cirri. First pair: has very unequal rami of 7 and 18 to 19 segments in the one, and 6 to 7 and 19 to 20 segments in the other specimen. Segments of shorter ramus about

as long as broad and with the inner and outer faces rounded; lower segments of longer ramus broader than long.

Second pair: rami slightly unequal, of 7 and 8 to 9 segments in the one, and 6 and 8 in the other specimen. Stronger, distinctly feathered spines disposed on the extremity of the last segment.

Third pair: rami with 7 and 9 in the one, 7 and 8 segments in the other specimen. Segments of the pedicel very elongate; the first bears a tuft of long hairs directed backwards and quite a row of short, delicate, spine-like points along its posterior face. The anterior face of the segments 2 to 7 of the anterior ramus is furnished near its upper extremity with a row of extremely minute teeth-like spines.

Fourth pair: rami unequal, of 12, and 15 to 16 segments. Middle segments about two and a half times as long as broad. Segments bear on anterior face only one pair of well-developed hairs or spines, and either one or two pairs of much more delicate ones. Anterior face of last segment of pedicel with a row of four curved teeth near distal extremity (Pl. XXII, fig. 1). The first and second segments of the shorter ramus show one distinct tooth and a minute one, and the third to fifth segments have two well-developed teeth and a small one, the 6th segment, however, has again one distinct tooth and a small one. Longer ramus without teeth along anterior face of lower segments.

The other specimen has 14 and 18 segments in the two rami. The same cirrus has again 4 teeth on the anterior face of the last segment of the pedicel, and the five inferior segments of the shorter ramus are armed with 1 or 2 teeth respectively on the anterior face of each.

Fifth pair: the 14 lower segments of one of the rami are furnished on the anterior face, near the distal extremity, with a curved tooth. This tooth stands either alone, or it is accompanied by a small secondary tooth.

Sixth pair: rami equal, of about 20 segments; the distal segments more elongate than the lower ones. As a rule three pairs of hairs on the anterior face of each segment (Pl. XXII, fig. 2); only one of these pairs is longer: the second pair is already short, and the third not or hardly visible. The number of segments in the 6th cirrus of the other specimen is 26, and the third pair of hairs on the anterior face, as a rule, is only to be made out with difficulty in this specimen.

Penis broken off in the one specimen, and very long and tapering towards the extremity in the other specimen.

The specimens of this species collected by H. M. S. "Siboga" came from two Stations:

Stat. 164. August 20, 1899. Lat. 1°42'.5 S., Long. 130°47'.5 E. Depth 32 m. Bottom: sand, small stones and shells.

Stat. 299. January 27/29, 1900. Lat. 10°52'.4 S., Long. 123°1'.1 E. Rocks- or Cyrus-bay, South coast of Rotti-island. Depth 34 m. Bottom: mud, coral and Lithothamnium.

General Remarks. This is the first time that the species described by DARWIN in 1854 has been re-examined. DARWIN knew it from the East Indian Archipelago and from the Philippine Archipelago. Although DARWIN's specimens were longer than mine ($^1/_4$ of an inch = 6.3 mm.), it is one of the smaller species, and as the specimens are, moreover, often

covered with mud, I think it is easily possible to overlook them: the species is perhaps more common than we suppose at present. In 1908, I received from Dr. VAN KAMPEN, who was at that time in Batavia, specimens of the same species, dredged at a depth of ± 45 m. in the Malay Archipelago: Lat. 6° 15′ S. and Long. 110° 50′ E.

19. *Balanus quinquevittatus* n. sp. Pl. XXII, fig. 3—10.

Shell conical, greyish-white, having five brownish spots on the rostrum, the latera and the carino-latera, and six small apertures immediately above the basis and between the sutures of the compartments. Scutum with the lines of growth smooth, tergum with the apex not produced.

This interesting form in certain respects approaches the genus *Acasta*; it belongs, no doubt, to the same group of species as *B. quadrivittatus*, *B. terebratus*, and several other species. It was found attached to the shell of a Gastropodous mollusc.

The general shape is conical (Pl. XXII, fig. 3), with the compartments smooth, not folded or ribbed. The orifice is pentagonal, small, hardly toothed. The carino-lateral compartments are narrow. The radii are very narrow and have oblique summits. The colour of the shell is dirty white and is not covered by a membrane. Near the orifice, all the compartments, the carina excepted, show a brownish spot, the colour of which corresponds with the bands observed in *B. quadrivittatus*. The basal margin of the different compartments is irregularly toothed; in the lower half the compartments are separated from each other by apertures of a longitudinal shape, about the same distance being occupied in the upper half by the radii. This gives the whole of the shell a very peculiar appearance and resembles, more or less, what is seen in *Acasta fenestrata*. The basis is thin, calcareous, and has no pores, so far as I could make out. The longest diameter of the basis measures 5.2 mm. in the largest specimen, slightly over 4 mm. in a smaller one.

The scutum (Pl. XXII, fig. 4, *a* and *c*) has the lines of growth only feebly indicated. It has the basi-tergal angle rounded, no adductor ridge, and the articular ridge narrow, not prominent.

The tergum (Pl. XXII, fig. 4, *b* and *d*) has the spur broad, bluntly pointed at the extremity. The basal margin is slightly hollowed out, the scutal margin straight, the apex pointed without being produced. The anterior margin of the spur makes an angle with the extremity of the basi-scutal margin.

With regard to the structure of the animal's body the following is to be noted:

Mouth. Labrum (Pl. XXII, fig. 5): notch deep and narrow, entrance only slightly wider. Lateral parts, on each side of notch, have an arched or curved outline. Three very small indistinct teeth are disposed between extremely short hairs on each side of notch. Shape of the thickened chitinous portion, which in other species of *Balanus* is sub-triangular, rhombiform: height and breadth nearly equal.

Palpi: of peculiar shape, with the upper margin straight and the lower margin convex, the two margins meeting in a rounded-off angle. The whole palpus rather narrow. Shorter hairs are disposed along upper margin, longer ones irregularly scattered over distal half of outer

surface, disposed somewhat more densely towards the distal extremity and along the inferior margin towards the rounded-off angle. The inner surface bears shorter curled hairs which form a longitudinal group almost parallel to upper margin.

Mandible (Pl. XXII, fig. 6): distance between extremities of teeth 1 and 2 about as long as that between teeth 2 and 3. Tooth 4 small, hardly to be distinguished, tooth 5 confluent with inferior angle, forming together a rudimentary knob. Part of mandible beneath 3rd tooth, small.

Maxilla (Pl. XXII, fig. 7): edge straight, two long spines at upper end and two slightly longer ones at the lower extremity of the edge. Between the two pairs a shallow notch and 5 spines arranged in a single row are seen (fig. 7*). Between the bases of each two spines an extremely small interspace is regularly seen.

Outer maxillae (Pl. XXII, fig. 8): outer lobe with nearly parallel and almost straight lateral margins, and with the summit obliquely truncated. Hairs scattered over large part of interior surface and many of them directed perpendicularly to longer axis of lobe. Inner lobe elongate, with numerous hairs which are relatively strong and more distinctly feathered than those of outer lobe.

Cirri. First pair: rami very unequal, of 6 and 14 segments respectively. Segments of the shorter ramus short, with rounded angles, the last segment with very strong spines situated on its extremity. Longer ramus has the lower segments broad and very short, the distal ones are almost quadrate.

Second pair: rami rather unequal, of 6 and 9 segments. A group of very strong spines is situated on the extremity of the last segment of each ramus.

Third pair: rami nearly equal, of 8 and 9 segments, spine-like hairs on anterior face of several segments of longer ramus extremely minute; pedicels very elongated. The first or basal segment of the pedicel has a dense row of curved hairs along its posterior face. The thorax bears a curved row of such hairs in continuation of those on the pedicel.

Fourth pair: second segment of the pedicel of each cirrus furnished with a row of about a dozen distinct teeth, which together form a saw-like longitudinal edge along the anterior face of the segment (Pl. XXII, fig. 9). The three lowest segments of the one ramus have a couple of such teeth, disposed on anterior face near the extremity of each segment. Number of segments in one of the rami 12, the other rami broken off. The middle segments bear two pairs of hairs on the anterior face; they are situated very close together and a large part of the anterior face of each segment is quite devoid of hairs in consequence.

Sixth pair: like the other cirri, broken off; therefore, number of segments undecided. The middle segments of the cirrus (Pl. XXII, fig. 10) have two pairs of hairs only, the upper pair longer, the more inferior one very short and situated at a distance from the upper pair, equalling about one fifth the length of the anterior side of the segment. Hairs on the posterior face disposed near the extremity not very long, groups formed of few hairs only.

Penis broken off, basal part rather broad; no sharp point is seen at the dorsal side near basis of penis.

Only a couple of specimens were taken; this happened at:

Stat. 164. August 20, 1899. Lat. 1°42'.5 S., Long. 130°47'.5 E. Depth 32 m. Bottom: sand, small stones and shells.

General Remarks. This species is no doubt closely related to *B. quadrivittatus*, which was dredged at the same station. I have been obliged to consider and to describe it as a distinct species, finding that not only the outward shape of the shell was different, but that the structure of the animal's body showed some very characteristic and remarkable differences. As already pointed out, the Station 164 is one of those where several species of *Balanus*, as well as other genera of Cirripedia were collected.

20. *Balanus hystrix* n. sp. Pl. XXII, fig. 11—18.

Shell dirty white, the other valves indistinctly, the carina distinctly ribbed longitudinally; orifice pentagonal, somewhat toothed. Radii triangular, with their summits oblique, striated horizontally. Scutum with a deep longitudinal groove parallel to the occludent margin, and with the articular ridge not prominent. Tergum with the longitudinal furrow open, and the basal margin forming a straight line on opposite sides of the spur. Inner faces of the middle segments of the cirri of the third, fourth and fifth pairs with several rows of teeth.

This small *Balanus* (Pl. XXII, fig. 11) has a rather depressed, globulo-cylindrical shell, being only slightly narrower at the large pentagonal orifice than at the basis. The orifice is indistinctly toothed, the surface is feebly-ribbed longitudinally, the carina, however, shows rather deep longitudinal ribs, the bottom of the furrows between these ribs being coloured dark blue or blackish. The radii have oblique summits, their surface is striated with lines parallel to the basis, their free edges are distinctly serrated. The summits of the alae are also oblique and are feebly rounded. The shell is thick and is strongly ribbed on the inner surface. It is perforated by a single row of rather wide quadrate canals, some of which seem to be open near the basis. The radii show traces of horizontal tubes or canals between the well-developed septa. The basis has numerous ridges radiating from its centre; they correspond with septa extending in the same direction and separating the canals of the basis from each other.

The colour of the shell is dirty white; here and there rudiments of a yellowish epidermis are seen attached to the surface. It seems to be a small species: the greatest diameter of the largest specimen collected measures 5 mm. at the basis.

The scutum (Pl. XXII, fig. 12, *a* and *c*), is of an elongately triangular shape and has the occludent margin strongly and sharply serrated; its tergal margin is feebly convex, its basal margin markedly so. The growth-ridges are not very prominent on the outer surface, but the rather deep longitudinal groove which extends parallel to the occludent margin is very characteristic, especially as there is a slight ridge or ledge between it and the occludent margin. As the growth-ridges pass transversely over the furrow, they divide it into a series of pits, which, however, are not very distinct. On the inner surface the articular ridge is not very prominent and extends over two-thirds of the length of the tergal margin. The cavity for the adductor

muscle is very shallow and the adductor ridge is very feebly indicated; the cavity for the lateral depressor muscle is somewhat more distinct.

The tergum (Pl. XXII, fig. 12, *b* and *d*) is short and rather broad. Its scutal margin is straight, its apex slightly, though not sharply pointed; its carinal margin is very feebly convex, and the two parts of the basal margin form together a straight line on opposite sides of the spur. Externally the tergum shows rather distinct growth-ridges and an open longitudinal furrow. The spur, which is obliquely truncated at the extremity, has a rather long free-extending part. Its width is about one fifth of the breadth of the entire valve. On the inner surface the articular ridge is long, but not very prominent, and the articular furrow is not very deep. The crests for the lateral depressor muscles are hardly visible.

With regard to the structure of the animal's body the following seems of interest:

Mouth. Labrum (Pl. XXII, fig. 13) with shallow notch, wide at entrance and three teeth on each side of it; the sub-triangular portion is not very broad but rather elongate.

The palpi are elongately oval, with the extremity rounded. The outer surface is furnished with a row of long and slender spine-like hairs standing at some distance from each other; near the free extremity the same surface is furnished moreover with a group of not very numerous hairs which pass imperceptably into the rather dense row of shorter hairs arranged along the upper margin. The hairs on the inner surface are short and delicate and grouped in the ordinary way: a longitudinal row is arranged in a line almost parallel to the upper margin and these hairs are directed towards the free edge of the labrum.

Mandible (Pl. XXII, fig. 14). Distance of the extremities of teeth 1 and 2 greater than that between 2 and 3, in the proportion as 4 to 3. Teeth 1 and 2 pointed, 3 thick and indistinctly double. Tooth 4 is small, tooth 5 and inferior angle are represented by small nobs.

Maxilla (Pl. XXII, fig. 15) with the edge straight, without a notch behind the upper pair of larger spines, and with five somewhat shorter spines on the middle part of the edge and two larger spines situated near the inferior angle, which itself bears a few shorter bristles. Several delicate hairs are observable between the spines.

Outer maxillae have the outer lobe elongately oval, and over a large part (the outer half) of the inner surface densely clothed with hairs, rather numerous ones being arranged in a row over the inferior half of the same surface; the inner lobe has the interior face rounded and furnished with not very numerous, but rather long and feathered hair-like spines.

Cirri. First pair with the rami very unequal, of 6 to 7 and 16 segments. Inferior segments with the inner faces somewhat protuberant.

Second pair with short rami, of 5 and 6 segments; the inner faces rounded and not protuberant, densely clothed with brushes of spine-like hairs.

Third pair considerably longer than cirri of second pair, having respectively 8 and 9 segments in the two branches. Second to penultimate segments (Pl. XXII, fig. 16) of both rami having the rounded inner faces armed with numerous teeth, grouped in rows, and diminishing in size from the front margin (where they appear like strong downwardly-curved teeth), over the surface, to the posterior margin.

Fourth pair has the rami unequal, having 11 and 15 segments respectively. The lower segments are shorter, the upper segments are more elongate, $2^1/_2$ to 3 times as long as broad This is the case in most species of *Balanus*; it is somewhat exceptional, however, that while the 3 distal segments of the shorter and the 5 distal segments of the longer ramus are furnished with only three pairs of spines of different size on their inner faces, the lower segments have, in addition, a row of downwardly-curved teeth developed along the anterior margin, rows of still smaller teeth being disposed on the inner face, in the same way as they are observed on the cirri of the third pair of this species. Of the shorter ramus, the first segment shows only one, and the second segment a few of these teeth, they are well-developed on segments 3 to 7, still represented by a few on segment 8, and not seen at all on segments 9 to 11. The longer ramus shows a few of them on segments 1 to 3 and 9 to 10, the segments 4 to 8 have them fully developed, and the segments 11 to 15 have none at all. Of the 3 pairs of spines observed on the upper segments, only two are seen on most of the lower segments. The tufts of spines on the dorsal surface of the segments, close to its upper margin, are only feebly developed.

Fifth pair has nearly equal rami of 16 and 17 segments. The lower segments are shorter, the upper segments elongate. The number of pairs of spines on the inner face of each segment is 3, a fourth pair of extremely short ones being already seen on several segments. The segments 5 to 9 are furnished in both rami of this cirrus with the same rows of teeth (Pl. XXII, fig. 17) which are seen on the middle segments of cirri 3 and 4. The teeth along the anterior margin of the segments of this cirrus are not so strong, however, as the corresponding ones of the preceding cirrus. The lower segments are furnished, on the dorsal surface, close to their upper margin, with a small tuft of spine-like hairs, one of which is nearly as long as the segment itself.

Sixth pair has nearly equal rami of 20 and 21 segments. Middle segments elongate, $2^1/_2$ to 3 times as long as broad, slightly broader towards distal extremity. Most segments are furnished on their inner face with four pairs of spines; the last pair of these is of greater length than the segment itself, the penultimate is a trifle shorter than the segment, the other two pairs being short and extremely short respectively. The rows of teeth which are observable on the inner faces of the middle segments of the 3rd to 5th cirri are completely wanting on the sixth cirrus (Pl. XXII, fig. 18). The tufts of spine-like hairs on the dorsal surface of each segment are only feebly developed.

On the pedicels of the 4th to 6th cirri on both segments, near the anterior face and the upper extremity, a group of small spine-like teeth of the same shape as those on the segments of the 4th and 5th cirri, but smaller, can be made out.

Penis of moderate length, tapering towards the extremity and with a few hairs scattered over the surface.

This species was collected during the cruise of H. M. S. "Siboga" at:

(± Stat. 231). November 14—18, 1899. Ambon-anchorage, Reef-exploration. The depth at the anchorage was 40 m., but it was not noted at the place where the small Balani were collected. Bottom: coral-sand.

General Remarks. This species, like several others of the genus *Balanus*, caused me great trouble, which was made greater by the scantiness of the material. I certainly would not have given a name to the species, nor undertaken a description of it but for the very special character of the species. I am quite sure that it will be possible to recognise it with the aid of the description given here, should it be found again. The shape and the structure of the opercular valves, of the scutum especially, show some resemblance to the valves of DARWIN's variety *vesiculosus* of *B. tintinnabulum*: the scutum shows a single row of square holes such as, according to DARWIN, are seen arranged in two or more rows radiating from the apex of the valve, on young specimens of the above-named variety. But this seems to be a somewhat accidental resemblance, the structure of the animal's body and of the cirri especially, being quite different. The very peculiar armature of the cirri of the 3rd pair, of the middle segments of the 4th cirrus (which in the present species is even repeated, though more feebly, on the cirri of the 5th pair), which DARWIN considered as characteristic for the genus *Acasta*, and which has now been observed by other investigators and myself in several species of *Balanus*, in no other species of this genus is so well-developed as in the present. The question as to the importance of this peculiar structure for the arrangement of the species of the genus *Balanus*, was discussed by me under the head of the genus itself.

7. Sectio: **Patella-Balanus**

21. *Balanus calceolus* Ellis. Pl. XXII, fig. 19—25.

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 218, pl. III, fig. 3*a*—3*e*.

This species is represented by a single specimen in the Siboga-collection. Its shape and the structure of the opercular valves leave no doubt as to its really representing this species.

DARWIN's diagnosis of this species is a very short one: parietes and basis porose; scutum with the pit for the lateral depressor muscle small and deep. The description and the figures he gives, however, are much more explicit.

The shell (Pl. XXII, fig. 19) is elongate and attached to a small piece of a yellowish-coloured stem which perhaps belongs to a species of *Gorgonia*. The longest diameter of the basis is about 8.5 mm., the greatest height of the shell 4.5 mm. The colour of the shell is dull white, the basal parts of the compartments however, are brownish-purple, longitudinal stripes of that colour radiating in the direction of the orifice; the basal cup which almost quite encloses the little stem is coloured white.

With respect to the scutum (Pl. XXII, fig. 20, *a* and *c*) I must point out that the apical part is slightly produced and upturned, the occludent margin being somewhat hollowed out. This is not seen in DARWIN's figure. Nor is the pit for the lateral depressor muscle so distinct in the Siboga-specimen, as, according to DARWIN, it should be. The tergum (Pl. XXII, fig. *b* and *d*) has the apex slightly more produced, but the shape of the spur, with its very characteristic longitudinal crests extending as so many little teeth beyond the margin, is exactly as in DARWIN's description.

DARWIN did not know the soft parts of this species. Therefore I used thore of the Siboga-specimen to make up this deficiency.

Mouth. Labrum (Pl. XXII, fig. 21): notch very wide at entrance, triangular, not very deep. Lateral parts bear three teeth on each side of notch and have rounded corners. The height of the sub-triangular shield is considerable and almost equals its greatest width.

Palpi ovate, with the free extremity rounded, the upper margin slightly, the inferior margin strongly bowed. The outer surface bears a double row of longer hairs or bristles, beginning at the free extremity and making an angle with the inferior margin; the same surface shows a group of such longer hairs disposed near the free extremity of the palpus. The margin of the palpus at the extremity, and the inner surface near that extremity are bordered by a number of quite microscopic hairs or ciliae. The latter surface bears a row of curved hairs at some distance from the upper extremity, which hang over the edge of the labrum when the palpus is not uplifted. The hairs arranged along the upper margin are short and not numerous, and go over towards the basis of the palpus in a group of hairs of equal size, scattered over the inner surface.

Mandible (Pl. XXII, fig. 22): the free edge has five distinct teeth and an inferior angle. Teeth 1 and 2 strong and pointed, tooth 2 with additional tooth, 3 blunt, with small additional tooth, 4 small, distinctly double-pointed; 5 also small, pointed; inferior angle terminating in three delicate flat teeth.

Maxilla (Pl. XXII, fig. 23): the free edge is relatively long and bears 2, 4 and 2 spines, the upper pair consisting of a broader and a somewhat narrower spine which are situated close together. There is a small but distinct notch (Pl. XXII, fig. 23*) at the base of which a few delicate hairs are discovered; then four somewhat thinner and shorter spines, and two long and slightly flexuous spines, situated at some distance from the inferior angle, the remaining part of the edge bearing about 5 delicate and relatively short spines. Such a shorter spine is also seen at the base of the second spine of the upper pair. Upper and lower margins not parallel but together forming an angle, shape of maxilla triangular in consequence.

Outer maxillae (Pl. XXII, fig. 24): the outer lobe is oval, short and remarkably broad. The tuft of spines seen along the upper margin and over inner surface of superior half, rather dense; few hairs only scattered over inferior half of same surface. Inner lobe broad and rounded, covered with numerous hairs, the longer ones seen along inner margin, rather strong and feathered and bent downwards and inwards.

Cirri. First pair has the branches unequal in breadth and, probably, in length also. The longer branch, however, is broken off in both cirri. The shorter one has 8 to 9 segments, which are distinctly protuberant on their inner face. These protuberances are covered with a dense group of straight and relatively strong spines.

Second pair has the branches slightly unequal, of 8 and 9 segments respectively; the 5 to 6 inferior segments are protuberant on their inner face. The protuberances bear numerous short and relatively strong spines arranged in several rows.

Third pair different from second by the inner faces of the segments being less protuberant and by the protuberances bearing only a single transverse row of spines. The

whole cirrus only little longer than the 2nd and having 9 and 10 segments in the two rami.

Fourth pair has 16 to 18, fifth 18 to 19, 6th pair 19 to 20 segments. All the segments (with the exception of the two or three last ones, which have only two pairs of spines) are furnished on their inner face with three pairs of spines (Pl. XXII, fig. 25) of unequal size. Each segment has at the outer face near the extremity a tuft of spines, of which one is longer, its length nearly equalling that of the segment. The shield-like swellings at the base of the 3rd to 5th cirri are furnished with dense tufts of long hairs which are directed towards the hindermost part of the body.

Penis is rather short; hairs on distal part directed perpendicularly to the long axis, a rather dense tuft is situated at and round the extremity.

The specimen was furnished with eggs in the mantle-cavity. The eggs have an elongately oval shape, are not quite twice as long as broad or thick; their long diameter is about 0.17 mm.

The specimen was collected at:

Stat. 164. August 20, 1899. Lat. 1° 42'.5 S., Long. 130° 47.5 E. Depth 32 m. Bottom: sand, small stones and shells. Several other species of *Balanus* (see the list in the introductory part) were collected at this Station.

Geographical Distribution. According to DARWIN this species is found on the West Coast of Africa, at Tubicoreen, near Madras and in the Mediterranean (?). According to WELTNER (Verzeichniss, 1897), the Berlin Museum has specimens from Japan, from West-Australia (Mermaid Strait), and from Guinea. All the Berlin specimens are attached to Gorgonidae. It therefore seems to have a world-wide distribution, and we cannot be astonished that it was found also in the Malay Archipelago.

The depth at which it was collected on former occasions is not mentioned.

22. *Balanus navicula* Darwin. Pl. XXII, fig. 26. Pl. XXIII, fig. 1—3.

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 221, pl. III, fig. 6*a*—6*d*.

A very small *Balanus* attached to a small stem of a *Gorgonia*, looks much like the figure of the above-named species (Pl. XXII, fig. 26, *a* and *b*) given by DARWIN. The narrowness of the carino-lateral compartments and an indication of striae on the surface of the scutum decided me to consider the specimen as belonging to this species.

The longest basal diameter, which according to DARWIN is 0.4 of an inch — over 10 mm. — in the Siboga-specimen measures only 2.6 mm.: it is, probably, a very young specimen. The rostrum is elongate, but the basis does not enclose the branch of the *Gorgonia*, therefore it is not furrowed as the case is in *B. calceolus*.

The scutum (Pl. XXIII, fig. 1, *a* and *c*) corresponds well with DARWIN's description, but the raised striae which should radiate from the apex in my specimen are indicated only by lines not very distinct. The adductor ridge is not developed, the articular ridge elongated. The tergum (Pl. XXIII, fig. 1, *b* and *d*) is slightly beaked, its scutal margin is nearly straight, whereas in DARWIN's figure it is somewhat hollowed out. The tergum is extremely brittle and its spur was broken off in both valves, therefore I am not quite sure that the figure given is quite exact.

DARWIN did not have the material with which to investigate the body of this animal. The small specimen from the Malay Archipelago, which can hardly be considered full-grown, furnished me with the following details:

Mouth. Labrum (Pl. XXIII, fig. 2): with three teeth on each side of the wide, triangular notch. The thickened sub-triangular shield is high, its height equalling the width.

Palpi: ovate with the lower margin more strongly bowed than the upper margin. Longer hairs on outer surface very few: 4 or 5 arranged in a longitudinal row which makes a very sharp angle with the margin near the free extremity. The upper margin bears a series of not very numerous hairs, diminishing in size towards the attached basis of the palpus; the hairs seen on the inner surface short and not numerous.

Mandible: much like that of *B. calceolus*; five teeth and an inferior angle, the latter terminating in two extremely small flat teeth.

Maxilla (Pl. XXIII, fig. 3): same structure as in *B. calceolus*, free edge rather broad and furnished with 2, 3 and 2 spines. Notch small, has a single hair or delicate spine situated at its base. Upper margin of maxilla very strongly curved, shape of the whole triangular, apodeme relatively long.

Outer maxillae: as in *B. calceolus*, outer lobe slightly more elongate.

Cirri. First pair with very unequal rami, of 5 and 9 segments respectively.

Second pair with slightly unequal rami, of 5 and 6 segments respectively.

Third pair with somewhat more slender and also slightly unequal rami, of 6 to 7, and 7 to 8 segments; no trace of teeth to be seen along or near anterior face of the segments, or on the longer or the shorter ramus.

Fourth pair with unusually short rami, of 10 and 12 segments respectively.

Fifth and sixth pairs have the rami longer: although the number of segments is 11 to 12 only, the segments are more elongate. The greatest number of pairs of spines observable on the inner faces of the segments is three; in some of the middle segments, however, a fourth extremely minute pair can be distinguished. Hairs seen on outer surface of segments near the extremity forming a small group, one being much longer than the others. (The cirri show more distinctly, I think, than do the parts of the mouth, that the specimen is a young one.)

Penis very long, tapering towards extremity, and bearing only a few and very minute hairs.

The specimen was collected at:

Stat. 144. August 7/9, 1899. Near the Anchorage north of Salomakiëe-(Damar-)Island. Depth 45 m. Bottom: coral and Lithothamnium.

Geographical Distribution: DARWIN saw specimens of this species only from Tubicoreen, Madras. According to WELTNER, the Berlin Museum has specimens from Singapore, attached to *Suberogorgia suberosa*.

23. *Balanus investitus* n. sp. Pl. XXIII, fig. 4—11.

Parietes and basis with pores, radii without pores. Scutum with adductor ridge; tergum

with the apex slightly beaked and without a longitudinal furrow. Shell and cup-formed basis covered by a tissue or film of the Alcyonarian to which it is attached.

This remarkable species presents us with an interesting case of commensalism. The cup-formed basis is attached to a part of the bifurcating stem of an *Acanthogorgia*, which is covered by a substance composed of a tissue interwoven with calcareous spiculae and developing here and there into little calyces, from the surface of which numerous spiculae stand off (Pl. XXIII, fig. 4). The shell of the *Balanus* is covered by the same substance which here also develops into numerous such calyces.

This *Balanus* belongs to the same section of the genus as *B. calceolus*, *B. navicula* and others. Its shape (Pl. XXIII, fig. 5) is conical, the shell being elongate, however, in its rostro-carinal axis. In both specimens it is the rostrum that, by its protraction, causes the elongation of the shell. The orifice is rather large and rounded, somewhat heart-shaped owing to a little excavation at the rostral extremity. The carinal-latus is relatively narrow, the latus triangular, with the summit horizontally truncated. The radii are narrow, with the summits somewhat oblique, the alae have the summits nearly parallel to the basis. The basis is cup-formed, much elongated towards the rostral extremity of the shell; in the median line the rostral part of the basis has a deep furrow, which quite encloses the stem of the colony to which the *Balanus* is attached. The colour is pale-yellowish, that of the basis transparent white; the shell is very thin and brittle, and the compartments readily separate.

The scutum (Pl. XXIII, fig. 6, *a* and *c*) is rather thick and has very distinct growth-ridges. Its basal margin is distinctly sinuous. The articular ridge is prominent, the adductor ridge slightly, yet distinctly developed; the cavity for the adductor muscle is indicated.

The tergum (Pl. XXIII, fig. 6, *b* and *d*) has the apex slightly beaked, the articular ridge well-developed, and the spur rather broad, and obtusely pointed. There is no longitudinal furrow, but in its place the surface developes into a kind of longitudinal crest. The crests for the depressor muscles although not prominent are distinctly indicated. The scutal margin is nearly straight, the basal margin, between the spur and the basi-carinal angle, distinctly hollowed out.

With regard to the structure of the animal's body the following may be of interest:

Mouth. Labrum (Pl. XXIII, fig. 7) with rather deep notch, wide at entrance, closed near the bottom. Three small teeth on each side, one of these, however, is wanting in one of the specimens. The lateral margins on each side of notch not quite in a line but together making an angle. The sub-triangular shield-like thickening is about as long (or high) as it is broad.

Palpi ovate, with the upper margin straight, and the lower margin distinctly convex, the two margins meeting each other in a rounded angle. Spines and hairs on surface not numerous; those along the upper margin short; a group of from four to half-a-dozen longer hairs are disposed on the outer surface along a line forming an angle with the lowor margin near the free extremity. The free extremity, moreover, bears a few longer hairs forming a tuft with those of the outer surface and the upper margin.

Mandible (Pl. XXIII, fig. 8) has five teeth; teeth 2, 3, and 4 are double. Tooth 3 has the larger one broad and flat. Distance between extremities of teeth 1 and 2, one and

a half times the distance between the extremities of teeth 2 and 3. Tooth 5 pointed. Lower angle small, yet well-developed, and terminating in 2 or 3 very small, flat, pointed teeth. Lower part of the whole mandible well-developed.

Maxilla (Pl. XXIII, fig. 9) with a distinct notch behind the two upper spines, a few short hairs being disposed at the base of the notch. Between the notch and the two lower spines, the free edge bears only 2 or 3 spines; where there are three spines the first after the notch is represented by a pair. The upper two spines are longer, the others hardly differ in size. The shape of the maxilla is triangular, its upper margin strongly bowed; the apodeme is long, as long as the maxilla itself, the spines included.

Outer maxillae (Pl. XXIII, fig. 10) have the outer lobe short and broad, and the hairs on the surface and at the free extremity not very numerous. The tuft formed by them on the extremity is not very dense. The inner lobe has the surface that is directed to the interior rounded, and covered with several stronger and feathered hairs, part of which are directed towards the basis of the maxilla. The outer maxillae, like the other parts of the mouth, show great resemblance to the corresponding parts of *B. calceolus* and other species of the section.

Cirri. First pair: branches unequal, with 5 to 6, and 9 to 10 segments. Segments not strongly protuberant, those of longer ramus somewhat more so than those of shorter ramus.

Second pair: 7 and 8 segments respectively in the two rami; distinctly developed tufts of hairs disposed on the protuberant parts of the segments.

Third pair: with 8, and 9 to 10 segments respectively. Groups of hairs less-developed than on cirri of 2nd pair, standing off in all directions and forming no distinct tufts.

Fourth pair: with 14 and 16 segments respectively in the two rami.

Fifth pair: with 15 and 17 segments respectively.

Sixth pair: with 17 to 18, and 18 to 19 segments. Three pairs of spines on the inner face of the segments (Pl. XXIII, fig. 11); in a very few cases only, a trace of a fourth pair could be made out. On the outer face of each segment and near the extremity, a few spines are seen, one of which is much longer than the others, and exceeds the length of the segments.

Penis: long in the one, unusually long in the other specimen, tapering towards the extremity; very few hairs scattered over its surface.

This interesting species of *Balanus* lives attached to the branches of an Alcyonarian, which NUTTING has determined as *Acanthogorgia truncata* Studer.

It was collected at:

Stat. 310. February 12, 1900. Lat. 8° 30′ S., Long. 119° 7′.5 E. Flores-Sea. Depth 73 m. Bottom: sand with few pieces of dead coral.

General Remarks. This species shows relationship to *B. navicula* in some respects at least. It forms a very natural and at the same time characteristic group with the other species of the same section.

A small specimen of a *Balanus* collected by the Siboga at Station 260, belongs, probably, to the same species. It was found attached to a reddish-brown stick, its shape

was conical, with a rather small opening. The shell was almost entirely covered by a yellowish tough coat, which covered the stick also. The coat being taken off, a transparent white specimen appeared, which, however, fell to pieces on being touched; it must have been dead on being dredged: the animal itself is wanting and of the opercula, only one of the scuta was present. This resembles in shape and by its distinct growth-ridges the same valve of *B. investitus* from Station 310. This is also the case with the calcareous basis, the rather broad alae, and the narrow radii. The specimen was collected at:

Stat. 260. December 16 and 18, 1899. Lat. 5° 36'.5 S., Long. 132° 55'.2 E. 2.3 miles N.W. from the North point of Nuhu Jaan, Kei-islands. Depth 90 m. Bottom: sand, coral, and shells.

24. *B. cornutus* n. sp. Pl. XXIII, fig. 12—16.

Carino-lateral compartment wanting. Rostrum elongate. Lateral compartments and basis growing out into lateral horns, the cup-formed basis terminating in four excrescences.

This remarkable form is represented by a single specimen. It belongs doubtless to the same group or section as *B. calceolus* and *B. navicula*, and in outward shape comes nearest to *B. galeatus*.

The shell is conical, elongate in the rostro-carinal axis, yet at the same time broad in consequence of the lateral outgrowings of the lateral compartments (Pl. XXIII, fig. 12 and 13). The orifice is rounded, slightly elongate and pointed at the carinal end. The carino-lateral compartments are wanting; the four radii, with their broad summits, which are parallel to the basis, are white and stand off very distinctly from the beautifully yellowish-red-coloured parietes. The shape of the radii is triangular, the alae are narrow, with nearly parallel margins. The lateral compartments and the carina show darker red-coloured longitudinal stripes, the colour of the cup-formed basis is darker in the middle and lighter towards the circumference, with concentric lines in the central part which are crossed by somewhat darker stripes extending from the centre to the circumference. The carinal half of the basis is free, the rostral half has a longitudinal furrow which is occupied by the stem of the organism to which it is attached. Parts of a yellowish-coloured very hard and horny epidermis are here and there attached to the surface of the shell.

Scutum (Pl. XXIII, fig. 14, *a* and *c*) distinctly convex, with rather prominent growth-ridges. Basal margin sinuous. The articular ridge occupies two thirds of the length of the tergal margin, it is reflexed, but narrow. The adductor ridge is confluent with the articular ridge in the upper part and quite indistinct in the lower part.

Tergum (Pl. XXIII, fig. 14, *b* and *d*) with the apex pointed but not produced. There is no longitudinal furrow, and the spur, the width of which is about half that of the whole valve, has the lower end obliquely rounded. The scutal margin is nearly straight; there is hardly any distance between the basi-scutal angle and the spur. The basal margin is slightly hollowed out on the other side of the spur. Crests for the depressor muscle very feebly developed.

Regarding the body of the animal only the following can be said[1]:

[1] Mouth and first pair of cirri were lost through an accident (boiling-over of the solution of caustic potash).

Cirri. Cirrus of second pair has slightly unequal branches of 6 and 7 segments. Segments are not protuberant, but their surfaces are distinctly rounded near distal extremity. Dense tufts of hairs are disposed on these rounded surfaces.

Cirrus of third pair (Pl. XXIII, fig. 15) is slightly longer than that of 2nd pair, and has 8 and 9 segments in the two branches. The anterior margin of each segment is distinctly rounded near the middle, and furnished with a group of hairs which does not form a tuft and is considerably less dense than that on the corresponding segments of the 2nd cirrus. With the exception of the last ones, the segments of both rami show a longitudinal row of small teeth between the hairs. These are slightly more distinct on the segments of the longer ramus and somewhat smaller on the first or basal segment of each ramus. A few smaller teeth are disposed on the surface of most segments, forming indistinct rows, parallel to the main row along the margin.

Cirrus of fourth to sixth pairs have the number of segments varying from 15 to 17. Greatest number of pairs of spines (Pl. XXIII, fig. 16) seen on anterior face of segments is 4. Of the group of hairs on exterior face near the extremity of the segments, one hair as a rule is much longer and stronger than the others.

Penis very long, few hairs on the surface, and hardly any at the extremity; rather thick and stout at the basis, tapering towards the extremity, which is narrow, almost pointed.

The specimen was collected at:

Stat. 164. August 20, 1899. Lat. 1°42′.5 S., Long. 130°47′.5 E. Depth 32 m. Bottom: sand, small stones and shells. It was found attached to a small piece of a brown stem, which, perhaps, is that of a species of *Gorgonia*.

General Remarks. In outward shape this species comes nearest to *B. galeatus* Linn., from which it is distinct, however, by the horn-like transverse excrescences of the laterals and by the absence of the carino-laterals. I think this is the first instance of a species of *Balanus* really showing only four compartments

25. *Balanus proripiens* n. sp. Pl. XXIII, fig. 17—21. Pl. XXIV, fig. 1—3.

Carino-lateral narrow, rostrum elongate. Basis with a longitudinal furrow. Scutum with the articular ridge well-developed and reflexed. Tergum broad with a very wide spur.

This new species is proposed for a form from rather deep-water (75—94 m.) that no doubt shows some resemblance to several species of Darwin's section B, but which, however, I think best to describe as a new species. It is represented by a single specimen: so as not to injure the specimen I refrained from investigating the structure of its parietes and basis. Its nearest relation, to judge by the shape of the opercular valves (the only parts of that species figured in Darwin's Monograph), seems to be *B. cymbiformis* Darwin.

The shape (Pl. XXIII, fig. 17) is elongate, lateral and rostrum, appear to creep along the thread-like stem of the *Gorgonia*. The shell is flattened laterally, the colour of the parietes and basis is white, with the exception of the carina, carino-lateral and adjacent parts of the lateral, which are pale-reddish, with slightly darker reddish longitudinal stripes. The

parietes and basis meet in an elegant flexuous line. The margins of the different valves and the colour of the surface appear only after the *Gorgonia* is taken away from the surface.

The carina is narrow at the upper extremity and much broader below; the carino-lateral is narrow, its breadth even diminishes from the basis to the upper end; the lateral is triangular, the rostrum is much elongated, as can best be seen from the figure. The radii are well-developed, increasing in width from the basis upwards, striated horizontally, their summits almost parallel to the basis; the alae seem to have oblique summits.

The scutum (Pl. XXIII, fig. 18, *a* and *c*), is narrow, its basi-tergal angle not so much rounded off, as, according to description and figure, is the case in that of *B. cymbiformis*. The articular ridge is well-developed and extends over half the length of the valve; it is distinctly reflexed. Pit for lateral depressor muscle hardly visible, cavity for adductor muscle somewhat more distinct. The teeth of the occludent margin are strongly developed.

The tergum (Pl. XXIII, fig. 18, *b* and *d*) is broad, the outer surface beautifully and delicately furrowed horizontally, and not flat but flexuous. The spur is broad, its basis obtusely pointed. It is limited by an extremely shallow longitudinal furrow towards the scutal side of the valve. Crests for the depressor muscle hardly visible.

The investigation of the animal's body gave the following results:

Mouth. Labrum (Pl. XXIII, fig. 19): notch triangular, wide, lateral parts nearly quadrangular, breadth of the sub-triangular shield greater than its height. Three teeth on each side of notch, and these are not pointed, but somewhat rounded at the extremity. On one side a tooth is wanting.

Palpi: oval, the upper margin not quite so strongly convex as the lower. Hairs on the outer surface not very numerous, forming an irregular group, some of them uniting to form a tuft, with hairs seen along free extremity. Hairs along upper margin rather numerous, those on inner surface also numerous and well-developed.

Mandible (Pl. XXIII, fig. 20): with five teeth, and the lower angle rounded off. Third tooth massive, 4th and 5th rudimentary, with rounded extremities. Distance between extremities of teeth 1 and 2 hardly greater than that between the extremities of teeth 2 and 3.

Maxilla (Pl. XXIII, fig. 21 and 21*): small notch below upper large pair of spines; a delicate spine situated at the bottom of the notch. Upper spines stronger than lower pair; between the two pairs 3 somewhat shorter spines are seen along the edge in the one maxilla, and 4 in the other. The latter spines diverge from the plane of the maxilla.

Outer maxillae (Pl. XXIV, fig. 1): outer lobe with straight inner and curved outer margin and the extremity obtusely pointed. Numerous hairs on distal half, a single row extending towards inner lobe, which is covered on its inner half with a group of feathered hairs which are directed inwards and downwards.

Cirri. First pair, branches very unequal, of 7 and 14 segments. The shorter ramus has five of its segments distinctly protuberant, the longer ramus has about 8 such protuberant segments. Protuberances bear dense tufts of hairs.

Second pair, branches slightly unequal, of 8 (indistinctly 9) and 10 segments. Hairs form dense tufts disposed perpendicularly on long axis of cirrus.

Third pair (Pl. XXIV, fig. 2), branches somewhat unequal, of 10 and 11 segments. Hairs do not form such dense tufts as on 2nd cirrus. Small but strong teeth along the anterior face of all the segments of the longer ramus. The teeth are arranged in groups of 2 to 4 on the distal half of the segments near the anterior margin, and in several rows. One of the spines situated on the tip of the last segment of this ramus is much stronger and looks almost like a claw.

Fourth pair has 19 and 20 segments respectively in the two branches. The 5 or 6 lower segments of the slightly shorter branch (with 17 to 19 segments) bear small teeth, either single, or double, or in groups of 3 or 4 near the anterior face (Pl. XXIV, fig. 3). These teeth are not situated exactly on the margin of the segments, but at a short distance from it, on the surface of the segments.

Fifth pair has 18 and 19, sixth 19 and 20 segments. Middle segments about twice as long as broad. Greatest number of pairs of spines on inner face 4 pairs. One of the hairs of the small group seen on exterior face of the segments, near the extremity, very long.

Penis: long, tapering towards extremity, hardly any hairs on surface.

The specimen of this species belonging to the collection of the Siboga, was found attached to a very long thread-like organism (a Gorgonacean) with distinct swellings at regular intervals. This seems to be *Scirpearella gracilis*. The substance covering the stem of the Gorgonacean is continued — as I pointed out above — over the surface of the *Balanus*; only after taking it away, I found that the said stem was quite enclosed in a longitudinal furrow of the slightly cup-formed basis.

The animal was dredged at:

Stat. 204. September 20, 1899. Lat. 4° 20′ S., Long. 122° 58′ E. The Station lies between the islands of Wowoni and Buton, northern entrance of Buton-strait. Depth 75—94 m. Bottom: sand, with dead shells.

8. Sectio: **Bathy-Balanus**

26. *Balanus pentacrini* n. sp. Pl. XXIV, fig. 4—10.

Shell white, surface of valves more or less distinctly furrowed longitudinally. Orifice large, toothed. Radii broad, summits oblique, alae with rounded summits. Scutum distinctly furrowed horizontally, articular ridge prominent, no adductor ridge. Tergum with the surface somewhat undulating and the spur situated near the basi-scutal angle. Parietes, radii and basis without pores. Labrum without notch.

This interesting deep-sea species connects the true Balani with the forms without radii, for which I propose to create the new genus *Hexelasma*. In the present species the outer surface of the shell is white and smooth; in the older (larger) specimens it is distinctly furrowed longitudinally (especially so towards the basal margin), in the smaller ones, however, either not or only indistinctly so. It is, moreover, feebly striated horizontally. The radii are rather broad and have the summits oblique, they are distinctly striated horizontally; the alae are also broad and have the summits rounded. The orifice is toothed. The whole shell (Pl. XXIV, fig. 4), especially

in the larger specimens and in the basal parts, is flattened laterally, which is caused by its being attached to the surface of a narrow object: the cirrus of a *Pentacrinus*. In some specimens moreover, the shell is distinctly unsymmetrical. Neither the compartments, nor the radii have pores. The basis, which is represented by an extremely thin, calcareous layer (so thin and transparent that the structure of the surface of the cirrus of the *Pentacrinus* can be seen through it) also devoid of pores.

Scutum (Pl. XXIV, fig. 5, *a* and *c*). The growth ridges on the outer surface are very distinct, broad, not very numerous, hence the surface looks distinctly furrowed. Its apex is pointed. On the inner surface it shows no trace of an adductor ridge and no cavity for the adductor muscle; the articular ridge, however, is prominent and extends over three quarters the length of the tergal margin. The cavity for the lateral depressor muscle is indicated, but only feebly developed.

Tergum (Pl. XXIV, fig. 5, *b* and *d*). The general shape of the tergum is triangular, with the scutal margin straight, the carinal margin slightly arched, and the basal margin distinctly hollowed out. The basal margin merges imperceptibly into the exterior margin of the spur; the latter is rather broad and its anterior margin is separated only by a very short distance from the basi-scutal angle. In the larger specimens, the interior margin of the spur is almost confluent with this angle. Externally the surface is undulating: the part along the scutal margin and that along the carinal margin being separated from each other by a triangular middle part, which lies on a somewhat deeper plane. On the inner surface the articular ridge is long and well developed, and this is also the case with the crests of the depressor muscles.

With regard to the structure of the animal's body the following may be pointed out:

Mouth. Labrum (Pl. XXIV, fig. 6 and 6*) without a central notch, a very shallow and rounded excavation being seen in its place. Teeth either small or not to be seen; in one of the specimens five small teeth could be made out on each side. Of the sub-triangular portion of the inner fold of membrane of the labrum, the basal margin can be seen as a crescent-shaped thickening, corresponding to the nearly horizontal chitinous list in other species of *Balanus*.

Palpi: of elongately-oval shape, with the free extremity rounded. The upper margin is nearly straight, the lower distinctly arched. A series of longer hairs disposed on the outer surface near the lower margin extend from the free extremity to about the middle of the palpus.

Mandible (Pl. XXIV, fig. 7) with five teeth, regularly decreasing in size from the first to the fifth. Distance between extremities of teeth 1 and 2 about one and a half times the distance between 2 and 3. Teeth 2 and 3 with small additional teeth. A little tooth representing the lower angle is confluent with tooth 5.

Maxilla (Pl. XXIV, fig. 8). A rather broad but shallow notch beneath upper pair of larger spines; edge beneath the notch slightly produced, armed with 4 to 5 somewhat shorter spines and the lower pair of longer ones. Numerous rather long hairs are seen between the spines, in the notch, beneath the lower pair, and round the lower angle.

Outer maxillae (Pl. XXIV, fig. 9) with the outer lobe short and broad; hairs on that lobe very numerous, forming dense tufts at the free extremity and round the convex outer margin. Hairs disposed on the inner surface delicate; those along the inner margin and

on the inner part of the surface of the inner lobe not much stronger and indistinctly feathered. The whole maxilla short and broad, the two lobes, however, very distinctly developed.

Cirri. First pair has the two rami very unequal and consisting of respectively 6 and 10 segments in the three specimens examined. The segments of the shorter ramus are slightly swollen, rounded at their inner face, they cannot however be said to be protuberant. On the longer ramus the hairs disposed on the segments are directed parallel to each other and to the longitudinal axis of the ramus. Those on the shorter ramus stand off transversely. On the tip of the last segment of the shorter ramus, a few stronger spines are observable, and on that of the longer ramus a couple of very long, indistinctly feathered, spine-like hairs.

Second pair has slightly unequal rami, of 6 to 8 and 7 to 9 segments.

Third pair has the rami somewhat more unequal than in second cirrus, of 8 to 10 and 9 to 11 segments. No trace of teeth on inner face of segments of this cirrus.

Fourth to sixth pair. Number of segments only slightly different: increasing from 19 in the fourth pair to 22 in the sixth. These numbers, however, could not be so well determined in all the specimens, as the tips of several cirri were broken off. Greatest number of pairs of spines seen on the inner faces of the segments: 4 (Pl. XXIV, fig. 10). On the exterior surface, close to its upper margin, each segment bears a group of usually three hairs, two of which are as long as the segment, the third being shorter.

Penis, long, as long as the cirri, or even longer, growing gradually narrower towards the extremity. Hairs on the surface very few, a few more at the extremity.

This species was collected by H. M. S. "Siboga" at two Stations, viz.:

Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral sand. (The trawl brought up pieces of grey clay, and manganese nodules, the interior of which consisted of dry clay). Two groups of specimens.

Stat. 253. December 10, 1899. Lat. 5° 48′.2 S., Long. 132° 13′ E. Depth 304 m. Bottom: grey clay, hard and crumbly. Numerous, most of them small specimens attached to the arms, cirri, etc. of a *Pentacrinus*.

General Remarks. This deep-sea species is, I think, especially remarkable by the structure of its mouth. It is a very distinct species, as shown by the shape of its shell and its opercular valves. But, it occupies a place of its own by the structure of the labrum, which has no notch. In this respect it approaches those deep-sea species that are characterised by the absence of radii as well, and which for this reason I think best considered as forming a new genus, for which the name *Hexelasma* is proposed in this Report.

Genus **Acasta** Leach

Darwin (1854) knew of nine species of this genus, and four species, so far I know, have been added to this list in the 58 years since elapsed. The new species are:

Acasta scuticosta Weltner[1], 1887, from Carthagena (Spain).

Acasta striata Gruvel[2], 1901, Atlantic Ocean, depth 400 m.

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[1] Weltner, W., Die von Dr. Sander 1883—85 gesammelten Cirripedien. Archiv für Naturgesch. LIII. S. 98—117. Taf. III—IV. 1887.

[2] Gruvel, A., Cirrhipèdes des Expéditions du Travailleur et du Talisman. 1902.

Acasta funiculorum Annandale[1], 1906, Gulf of Manaar, Ceylon.
Acasta Dofleini Krüger[2], 1911, East-Asia.

One of the species described by DARWIN (*A. undulata*) is known as occurring only in a fossil condition, viz. in Coralline Crag (Sutton). The number of known living species, therefore, at present would be twelve, or fourteen with the two described as new in the present paper.

In the 6th province, including the Malay Archipelago, this genus is richly represented; nine species are now known from this region:

Acasta sulcata Lamarck: Philippines, collected by CUMING, according to WELTNER[3].
Acasta laevigata J. E. Gray: Philippine Archipelago (DARWIN, WELTNER).
Acasta glans Lamarck: Pepela Bay, Rotti Island; Java Sea.
Acasta fenestrata Darwin: Philippine Archipelago (DARWIN).
Acasta purpurata Darwin: Philippine Archipelago, Sumatra (DARWIN).
Acasta sporillus Darwin: Sooloo (Sulu?) Islands, East Indian Archipelago (DARWIN).
Acasta funiculorum Annandale: Gulf of Manaar, Ceylon.
Acasta conica n. sp.: Spermonde Bank, Macassar.
Acasta nitida n. sp.: Java Sea.

Of the other known species, *A. cyathus* Darwin, according to WELTNER[3], occurs on the coast of Australia, and *A. Dofleini* Krüger in East-Asian waters. These species, or one of them, may perhaps, be found also in the East Indian Archipelago. As most of the species live quite embedded in sponges, they are, of course, easily overlooked; a careful examination of sponges to see if they are inhabited by species of this genus might show that more forms of it are still living, and that the known species have a wider geographical range than is at present supposed.

Very little is known of the geographical range of most species and several are known to occur at only one particular locality. *A. spongites* Poli is said to occur on the South Coast of England, in the Mediterranean, near the Cape of Good Hope, and, according to WELTNER, is found also at Hakodate (Northern Japan). Of late (1911), PILSBRY has described a so-called subspecies of this species as occurring off Kagoshima Gulf, Japan, at 185 meters. This species would therefore be a fair instance of world-wide distribution as occurring in this genus. But it would be necessary to settle, by comparative study of sufficiently rich material, that the specimens from these different localities really belong to the same species.

Most species seem to live only in shallow water. *A. striata* Gruvel is the only known deep-sea species of this genus: it is an Atlantic species collected by the French cruiser "Travailleur" at a depth of 400 m. PILSBRY's subspecies of *A. spongites* Poli would represent, however, another case of an *Acasta*-species occurring in deep water (185 m.). ANNANDALE does not say at what depth his new Ceylon species (*A. funiculorum*) was collected, but, most probably, it was found near the coast and in shallow water (coral reefs off Ceylon, on

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[1] ANNANDALE, N., On the Cirripedia (of the Report on the Pearl Oyster Fisheries of the Gulf of Manaar) Ceylon Pearl Oyster Fisheries. Supplement. Report. N0 XXXI. 14 pag. 1906.

[2] KRÜGER, PAUL, Beiträge zur Naturgeschichte Ostasiens. Beiträge zur Cirripedien-fauna Ostasiens. Abhandl. Akad. Wiss. München. Math.-phys. Kl. Supplement-Bd. 2. N0 6. 72 S. 4 Taf. 1911.

[3] WELTNER, W., Verzeichnis der bisher beschriebenen recenten Cirripedienarten. Arch. f. Naturgesch. 1897, Bd. I.

Turbinaria). The new species from the Malay Archipelago, which will be described in this report, are also inhabitants of shallow water.

According to DARWIN, *Acasta* is always embedded in sponges, or in the sponge-like outer layer of the skeleton of *Isis*. ANNANDALE took his new species from the surface of *Turbinaria*, a Madreporarian coral. KRÜGER does not inform us from what host his new *A. Dofleini* was taken. WELTNER's *A. scuticosta* was found living in a sponge: *Tethya lyncurium* Johnst. GRUVEL, with regard to his new species, *A. striata*, only says that it was "ramenée d'une profondeur de 400 mètres". With regard to the Siboga-species, *A. glans* from Pepela-Bay, Rotti-island, was handed to me disengaged from the sponge in which, presumably, it was originally found embedded; the other specimens of this species, which were collected by the Dutch Fishery Inspection-Steamer "Gier", are still partly covered by pieces of sponge. *A. conica* n. sp. came into my hands with the sponge in which it is embedded. The surface of the latter shows almost quite globular excrescences, with a small oval opening at the tip, and the *Acasta* is found in this excrescence, the aperture of its opercular valves corresponding exactly to the opening of the sponge. The specimens of *A. nitida* n. sp. were taken out of the sponge and even quite clean when they came into my possession.

A few words may be said here on the peculiar position of the genus *Acasta* in the classification of the Sessile Cirripedes. DARWIN considered it as a Sub-Genus, without saying exactly what he meant by that term and "hoped" he might stand excused for admitting it as such. According to him the species of this genus, in the structure of the shell, and in all the characters derived from the opercular valves and animal's body, cannot properly be distinguished generically from some species of *Balanus*. He pointed out that some species of the latter genus (*B. navicula* and *B. cymbiformis*) agree in all essential respects with *Acasta*, and differ only in the shell being more elongate and in being attached to *Gorgoniae* instead of to sponges; *Acasta purpurata*, however, lives embedded in the outer layer of the skeleton of *Isis*, so that even the habit of living embedded in sponges fails in that species. There are, on the other hand, species of *Balanus* (*B. spongicola*, *B. declivis*) that inhabit sponges .... DARWIN finished by saying that the most important character of *Acasta* probably consists in the anterior ramus of the fourth pair of cirri differing slightly in the arrangement of its spines, and in some other points, from the rami of the posterior pairs of cirri, and considered this as a character not as yet observed in any other Cirripede.

As I pointed out when discussing the difficulties of subdividing the genus *Balanus*, this very same character is observed, however, in further species of *Balanus*, and, certainly, the validity of the genus *Acasta* has not been strengthened by this discovery. But, on the other hand, the present known species of *Acasta* seem together to form a very natural group, characterized by the thinness of the parietes in which pores are absent, by the great development of the radii, by the cup-formed basis and by their living — with a single exception — embedded in sponges. Therefore I would not consider it an advantage to cancel this genus and to include its species in the genus *Balanus*, however closely related the two genera may be. Perhaps a thorough study of sufficiently rich material of those species of *Balanus*

that I propose to include in the sections *Patella-Balanus* and *Armato-Balanus*, and at the same time of the known species of *Acasta*, might lead to a somewhat different conclusion — but with our present knowledge I think the best we can do is to bear in mind the near relationship existing between the two genera, and at the same time to avoid bringing together too closely what after all, perhaps, should be kept apart.

1. *Acasta conica* n. sp. Pl. XXIV, fig. 11—16.

Carino-lateral parietes narrow, hardly one tenth of width of lateral parietes; inner surface of parietes distinctly ribbed, outer surface smooth in the lower half and looking as if covered with scales in the upper half. Scutum broadly triangular, the outer surface delicately striated longitudinally, the articular ridge feebly developed; tergum with a deep longitudinal furrow and the spur obliquely-truncated, not quite one fourth of width of valve. Basis conical, its edge feebly crenated. Upper segment of pedicel of 4th cirrus with a row of well-developed teeth, lower segments of anterior ramus of same cirrus with groups of such teeth near the extremity of their inner faces.

This species (Pl. XXIV, fig. 11) belongs, no doubt, to the same group of species as *A. spongites* Poli and *A. sulcata* Lamarck. All the specimens I have seen were very small. Their colour is greyish-white, the occludent margin of the scuta having a black colour. The orifice is rather large and distinctly toothed, the tips of the compartments being pointed, and the summits of the alae and radii very oblique. These tips are somewhat curved inwards — but not so strongly as is the case in *A. nitida*. The surface of the parietes is smooth in the lower half, covered in the upper half with rounded scale-like patches, the exact nature of which I have not been able to discover. I can only say that the rounded patches on being examined with the microscope turn out to represent thinner parts of the wall. Small calcareous projections are disposed here and there on the surface; they seem to occur more generally and in greater numbers on the rostrum and carina than on the lateral valves. The inner surface of the valves is distinctly ribbed; these ribs do not quite reach to the basal margin of the valve. The edge of the basis is delicately crenated, but the little teeth of that edge do not correspond to the ribs of the valves, the latter being much less numerous. The radii extend down to the basis, but their summits are very oblique and their free edge is in contact with the adjoining latus over less than half the length of that latus. The surface of the radii shows feeble horizontal lines crossed by still less distinct oblique striae. The alae are about the same width as the radii, but they do not extend down to the basis. The basis is not very deep but distinctly conical.

The size of one of the larger specimens is: total height 4.5 mm., of the capitulum without the basis over 3 mm. Greatest basal diameter 3.5 mm.

Scutum (Pl. XXIV, fig. 12, *a* and *c*) triangular with the basal margin strongly convex, the basi-tergal angle much rounded off. Growth ridges very prominent, distinct till close near the apex. Outer surface moreover, distinctly striated longitudinally, the striae extending from the apex down to the basal margin. The upper part of the occludent margin is coloured

dark-purple; the teeth along that margin are sharp and prominent in the lower half. The articular ridge is only slightly developed, it does not terminate abruptly downwards, but it merges insensibly into the tergal margin. At the place of the adductor ridge, a longitudinal crest which is slightly prominent is observable, but this can be traced from the apex down to the basal margin of the valve. The cavities for the musculi depressores are only faintly indicated.

The tergum (Pl. XXIV, fig. 12, *b* and *d*) is elongate and slightly beaked, the spur is truncated, obliquely cut off, its width not quite one-fourth of width of valve. The outer surface has a well-developed longitudinal furrow, which is narrow at the apex of the valve and increases in width towards the extremity of the spur. Growth-ridges distinctly developed, narrow and numerous. On the inner surface the articular ridge is well-developed, while the crests for the musculi depressores can hardly be made out. The same dark-purple that is seen along the upper part of the occludent margin of the scutum, is observable also along the inner side of the articular ridge, and along the carinal margin of the tergum.

The study of the structure of the animal's body yielded the following results:

Mouth. Labrum with the notch not very deep, wide at entrance. Three small teeth on each side of notch. Shape of rhombiform shield-like portion much as in the other species.

Palpi somewhat square, not strongly swollen towards the extremity, hairs less numerous than in *A. glans*, but the general arrangement is the same.

The mandible (Pl. XXIV, fig. 13) has five teeth, and the lower angle truncated. The free edge is rather elongate, the lower part narrow. The second and third teeth are double, the free margin of the fourth is dentated, the fifth is short and pointed at the extremity. The truncated lower angle bears two short spines.

The maxilla has the upper and lower margins almost parallel — it does not in consequence grow much broader towards the free edge. This edge is nearly straight and the notch under the upper pair of larger spines is hardly to be distinguished. A double row of five spines, all of about the same length, is arranged between the upper and under pair of spines.

The outer maxillae (Pl. XXIV, fig. 14) have the outer lobe short, much shorter than in the other species of *Acasta* I was able to compare; the inner lobe seems to be somewhat more elongate than is the case in the other species. The hairs are distributed over the inner surface of the lobes in the same way as in the other species; those observed on the line extending from the outer to the inner lobe do not form a regular double row, and those on the inner lobe are less numerous than in *A. glans* on the same part.

Cirri. First cirrus has very unequal rami of 6 to 7 and 16 segments in an older specimen, and of 5 and 13 segments in a younger one. Those of the shorter ramus are somewhat broader, yet not protuberant on the inner face. Most segments of the longer ramus are of an almost quadrate shape. Spine-like hairs on the inner face of the segments of the shorter ramus, numerous ones at the extremity of the last segment of that ramus, but a few only at the tip of the last segment of the longer ramus.

Second cirrus also with strongly unequal rami of 6 and 9 segments in a younger specimen and 6 and 7 segments in an older one. The segments are a little longer than broad;

they are furnished with hairs in the ordinary way, with stronger spines on the inner face of the segments and on the extremity of the last segments, but the tufts are perhaps not quite so dense as in the other species of *Acasta* I examined.

Third cirrus (Pl. XXIV, fig. 15) not inconsiderably longer than second, the segments of the pedical being much longer. Rami slightly unequal, of 9 and 10, 8 and 9 segments respectively. The segments 1—5 of the anterior ramus are furnished on their inner face, near the upper margin, with a group of short spine-like teeth. The segments 2 and 3 are furnished, moreover, with a somewhat stronger tooth-like spine situated beyond the middle of the inner margin and standing off quite horizontally. These spines were not seen, however, in a younger specimen.

Fourth cirrus (Pl. XXIV, fig. 16): the inner margin of the last segment of the pedicel is furnished with a row of 12 pointed teeth, which increase in size from the basis to the extremity of the segment. A few smaller teeth are disposed along the main row, increasing in number and size towards the extremity of the segment. The lower segments of the anterior ramus are furnished with a group of strong and partly very strong spine-like teeth on their inner face and near the upper margin, the teeth standing with their basis up and near each other. In all, 9 of the 14 segments of the anterior ramus were found furnished with such groups of spines, which on the 15 segments of the posterior ramus are completely wanting. The segments of the latter ramus are furnished on their inner face with three pairs of spines: one pair of long ones near the outer extremity, a pair of extremely minute ones about the middle of the segment, and a pair not quite so small half way between the two other pairs.

Fifth and sixth pairs of cirri almost equal, of about 20 segments, which towards the extremity increase in length and at the same time grow narrower. The longest and narrowest segment is about five times as long as broad. The three pairs of spines are of the same size, and are distributed over the inner face of the segments in the same way as described for the posterior ramus of the fourth cirrus. Some of the segments of the 5th cirrus bear, moreover, a short tooth-like spine, which stands off horizontally from the distal part of the inner face of the segment.

Note. The description of the 4th to 6th cirrus is given from a smaller specimen; in the somewhat larger one I examined, these cirri were broken off, only three or four of the lower segments being present.

The penis is long and does not taper so strongly towards the extremity as in *A. nitida*. It is distinctly ringed; its distal part is covered with longer and more numerous hairs than in the other species of the genus.

This species was collected by H. M. S. "Siboga" at:

Stat. 73. Pulu Barang. Macassar, Spermonde-bank. The depth at which the Sponge containing the *Acasta* was taken is not given. According to the list of Stations the depth ranges from 45 m. to surface, at 2 miles W. of edge of Spermonde-bank.

2. *Acasta nitida* n. sp. Pl. XXIV, fig. 17—19. Pl. XXV, fig. 1—3.

Carino-lateral parietes about one fourth of width of lateral parietes; all the parietes

curved inwards towards upper extremity. Orifice rather small and distinctly toothed. Longitudinal rims furnished with small teeth, which in the younger specimens are more distinct and in the older ones less distinct, extend from the upper extremity of the parietes downwards. Scutum very broad, with short but strongly developed articular ridge. Tergum with the apex beaked, a broad obliquely truncated spur, a deep longitudinal furrow, and the surface between the furrow and the carinal margin beautifully decorated with crossing horizontal and longitudinal lines. Basis conical, with the edge almost quite smooth. Fourth cirrus with rows of teeth along inner face of pedicel and numerous segments of anterior ramus, fifth cirrus with similar teeth along inner face of several segments of anterior ramus.

This beautiful and very characteristic species (Pl. XXIV, fig. 17) is coloured orange-pink in the smaller and lighter pink in the larger specimens. The shape of the younger ones is more globular, that of the older ones somewhat more elongate, the height of the capitulum as a rule slightly surpassing that of the cup-formed basis. The upper parts of all the parietes are curved inwards, and the tips enclose a moderate sized orifice of curious shape (Pl. XXIV, fig. 18). The outer surface of the parietes is — in the younger specimens — furnished with small spine-like points arranged on longitudinal ribs and decreasing in number and size from the upper extremity downwards. These ribs and the points disposed on them are much less prominent in the older specimens. There are five of these ribs on the rostrum, four on the laterals, three on the carina, while the carino-laterals have a series of such points along each longitudinal side. For the rest, the outer surface is smooth, the inner surface being strongly ribbed in longitudinal lines. These ribs on the lower half are crossed by transverse ribs, the inner surface having there a reticulated aspect. The radii are not very broad and do not extend down to the basis; no apertures are left in the lower half, between the compartments. The summits of the radii are very oblique, their edges are not crenated. The outer surface is feebly marked by horizontal lines of growth and also by oblique lines running parallel to the lower half of the lateral margin. The alae are about half the length of the parietes, they are slightly broader than the radii, have more distinct horizontal lines of growth, and like the radii have very oblique summits.

The size of a large specimen was: total height 8.5 mm., height of the capitulum 5.5 mm., greatest basal diameter 6 mm.

The scutum (Pl. XXV, fig. 1, *a* and *c*) is relatively broad and short: the occludent and basal margins are long, the tergal margin relatively short. The occludent margin is almost straight and only superficially toothed; the basal margin is undulating, the lateral parts of the outer surface being somewhat lifted up. The tergal margin is distinctly convex. Lines of growth well-marked, longitudinal lines feebly indicated and only on the apical part of the valve. Articular ridge short, broad, with rounded circumference, articular furrow deep. Cavity for the musculi depressores indicated, but shallow.

The tergum (Pl. XXV, fig. 1, *b* and *d*) is also broad, nearly as large as the scutum and as strong or thick. Its carinal margin is curved, hence the angle it makes with the feebly excavated scutal margin is somewhat produced: beak-like. The spur is short and broad, more than one third of the width of the whole valve. Its base is truncated and extends parallel

to the basal margin. A broad longitudinal furrow separates the scutal part of the valve from the part along the carinal margin. On the latter part, the horizontal lines or ridges of growth are crossed by very distinct longitudinal ridges, the surface being divided into small squares each of which is distinctly excavated. The inner surface shows a short, strongly-curved articular ridge and a deep articular furrow; the crests for the musculi depressores are not visible, the valve, however, is somewhat excavated at that place.

The structure of the animal's body may be judged from the following details:

Mouth. Labrum much like that of *A. glans*, but the notch less deep and only two small teeth on each side of it. The rhombiform shield-like portion nearly as high as broad. The palpi are swollen towards the extremity, with a somewhat longer distal margin; outer and inner surface and upper margin covered with hairs in the same way as in the above-named species.

The mandible (Pl. XXIV, fig. 19) has five teeth and the lower angle rudimentary. Teeth 2, 3 and 4 are double. As in other species of *Acasta*, the free margin extending from the 1st to the 2nd teeth is quite straight and that between the second and third teeth is an exact prolongation of that between the two foregoing teeth. The fifth tooth and the lower angle are quite reduced and rudimentary; the inferior part of the mandible is not so strongly elongate as is the case in *A. conica*.

The maxilla grows broader towards the free edge and has this edge rather long in consequence. No notch under the upper pair of larger spines; about nine spines are seen between this upper and the lower pair of larger spines. Of the intermediate spines 4 are directed with their free extremity to one side, 5 to the other.

The outer maxillae (Pl. XXV, fig 2) have the outer lobe of an oval shape, rather long, slightly shorter, however, than in *A. glans*. The hairs on the inner surface are numerous and delicate and form a dense brush at the extremity and along the upper part of the inner margin of the lobe. Each hair of this brush is distinctly bent near the extremity. There is a row of hairs along the inner margin which stand off horizontally, and this can be followed to the upper margin of the inner lobe. The inner lobe has its surface, which is directed towards the interior, rounded, and is furnished along the interior margin with numerous hairs, which are directed towards the basis of the maxilla. These hairs are delicate, most of them are very delicately feathered.

Cirri. First pair has very unequal rami of 8 and 18 segments; those of the shorter ramus are not broader than those of the longer ramus; they have the inner face rounded, only slightly protuberant. The hairs seen on these rounded parts and those on the extremity of the last segment are a little stronger than the remaining ones, but the difference is not so striking as in *A. glans*.

The cirrus of the second pair has unequal rami of 8 to 9, and 12 segments; all the segments have the inner face somewhat rounded and furnished with dense groups of delicate hairs. The spine-like hairs on the extremity of the last segment of each ramus are distinctly stronger than the other hairs.

The third cirrus is only slightly more slender and elongate than the second; its rami are nearly equal and have 11 and 12 segments respectively. Tufts of hairs on the rounded inner

face of each segment, and those situated at and near the upper extremity of the outer surface of the segments not so dense as those on second cirrus.

The fourth cirrus (Pl. XXV, fig. 3) has 24 segments in the shorter (anterior) ramus and perhaps a few more in the other — this ramus being broken off in both cirri. Last segment of pedicel with a row of teeth along the front margin, which looks perfectly like a saw in consequence. The teeth increase only very slightly in size from the base of the segment towards the tip. A large number of segments of the anterior ramus show a series of such teeth along the inner margin, the number of these teeth varying from 4 to 6 on the 12 lower segments of this ramus. The teeth are somewhat claw-like and directed downwards, growing somewhat smaller from the lower towards the upper segments. The 12th segment has only 4 of these teeth; the segments 13 to 15 have also 4, but they are directed upwards with their tips. The segments 16 to 19 have 3, 2, 2 and 1 respectively of these teeth, which, moreover, grow gradually smaller. The posterior ramus has no teeth on the 10 lower segments, and has rows of 4 to 6 teeth along the inner face of the 9 following segments. These teeth are generally somewhat smaller than those on the anterior ramus and are, as a rule, directed upwards. The distal part of the inner face of each segment, in both rami, is furnished with a group of spines which represent the pairs of spines seen on the segments of the other cirri: the lower segments have only one pair, the following two to three pairs, placed so close together as to touch each other at the basis.

The cirrus of the fifth pair has elongate rami of 26 to 28 segments. Several segments of the anterior ramus — in the specimen I investigated more carefully, segments 3 to 24 — have the inner face or front margin furnished with a row of teeth, of the same shape but a little smaller and less numerous than those along the segments of the 4th cirrus. As a rule each row has three such teeth, sometimes, however, four or even five. They are completely wanting on the posterior ramus. They are as a rule curved downwards. The segments of the posterior ramus are furnished on their inner face with three pairs of spines. They are inserted along the upper half of the inner margin, yet not crowded together. On the outer face of each segment, close to its upper margin, a small group of delicate spines is situated: these are longer on the lower than on the upper segments.

The cirrus of the sixth pair has nearly equal rami of about 30 segments. The segments grow — as in the other cirri — somewhat longer and more slender, from the basis to the tip of the cirrus; they become, even where they are most slender, not longer than three times their breadth.

Penis long, rather thick at the basis, growing very narrow towards the extremity. Surface furnished with numerous short hairs which stand off perpendicularly from the surface.

This interesting species is not represented in the collection of H. M. S. "Siboga". It was sent to me with other Cirripedia taken in the Western part of the Malay Archipelago. As it was studied by me along with other species of the same genus collected by the Siboga in those waters, I think its description can be usefully inserted at this place. The exact locality of its occurrence was:

H. M. S. "Gier", N° 12, Experiment 13. Lat. 6° 15′ S., Long. 110° 50′ E. Depth 40—50 m.

3. *Acasta glans* Lamarck. Pl. XXV, fig. 4—11.

DARWIN, Ch., Monograph. The Balanidae, Verrucidae, etc. 1854. p. 314, pl. IX, fig. 5*a*—5*c*.

According to DARWIN, this species is characterized by parietes which on the inner surface are quite smooth, and which have the lateral margins of each compartment inwardly prominent. The basis has the edge not (or only rarely) crenated, but furnished with six inwardly prominent teeth. The scutum is strongly striated longitudinally.

The Siboga collected a small specimen of an *Acasta* at Station 301 (Pepela-Bay, East-Coast of Rotti island), which at first I considered to be different from the known species of that genus. As I did not wish to disunite the specimen, I could not examine the inner structure of the compartments etc., and so doubt remained regarding its determination. I received afterwards numerous specimens of an *Acasta*, collected in the Java-Sea by the exploration-vessel "Gier"; I found that it corresponded to the smaller specimen from Pepela-Bay, but also, that there was sufficient ground for determining it as *A. glans* Lamarck. Since DARWIN's description of this species is rather short, and as it is not sufficiently illustrated (the figures given on DARWIN's Pl. IX illustrate only the basis seen from within, the compartments seen from within, and the tergum, internal view), it has been difficult to come to a conclusion — for several reasons, however, I think the one I arrived at is well-founded.

The inner structure of the parietes is exactly as in DARWIN's definition, the basis shows the six inwardly prominent teeth, and the scutum is striated longitudinally. The small specimen from Pepela-Bay (Pl. XXV, fig. 4) came in my hands detached from the object (sponge?) in which it had been embedded. But the specimens taken by the "Gier" are embedded in an open and porose sponge. The greatest diameter of the basis of the specimen from Pepela-Bay is 8 mm., the height of the shell 9 mm. Those taken by the "Gier" are larger: diameter of the basis from 10 to 13 mm., height of the shell from 15 to 17 mm.

The colour of the shell is dirty white to pale pink, with, in some specimens, the upper part reddish, the sheath being coloured slightly darker and transversely ribbed. The outer surface of the parietes shows distinct horizontal growth-ridges. In the younger specimens and in that of Pepela-Bay especially, the outer surface is studded with short calcareous points, irregularly distributed but disposed in transverse rows and somewhat more densely a little above the basis. The basis itself is almost quite flat in some specimens, in others irregularly cup-shaped, but never very deep; the central part sometimes forms a semi-globular excrescence.

The shape of the shell is somewhat flattened laterally, the tips of the parietes are curved inwardly, the orifice is medium-sized and distinctly toothed. The tips of the parietes are — in the older and larger specimens especially — often broken off. The radii have very obligue summits, the free margin being somewhat undulating; they are broadest about the middle and grow very narrow towards the basis; they are distinctly striated horizontally, the striae being crossed — in the larger specimens — by very faint longitudinal lines. The alae are about as broad as the radii; their free lateral margin is strengthened by a longitudinal rim. Rostrum and carina are broader than the lateral compartments, the carino-lateral compartments are about one-fourth the width of the parietes of the lateral compartments. The radii, where they are broadest,

are about three-fifths of the width of the lateral compartment at its basis. The inner structure of the parietes corresponds well to DARWIN's description.

The scuta (Pl. XXV, fig. 5 *a*, fig. 6 *a*) are elongate, narrower and thicker than in several other species of the genus. They are distinctly convex, the outer surface being hollow: bowed from the basal margin to the apex. The surface is strongly striated with longitudinal lines, the transverse growth-ridges are also prominent, the occludent margin is distinctly toothed in consequence. The longitudinal striae are much more prominent in younger (smaller) specimens than in larger ones. The part of the valve along the tergal margin makes an angle with the remaining part; it is obliquely truncated at the basi-tergal angle. The articular ridge is not very strongly developed, in older specimens, however, relatively more prominent than in smaller ones; the adductor ridge cannot be distinguished, but the cavity for the lateral depressor muscle is — in older specimens — well-developed.

The terga (Pl. XXV, fig. 5 *b*, 6 *b*) are flat and in younger specimens narrow: they seem to grow broader with age. The part corresponding to the spur is about half the width of the whole valve, it is obliquely truncated, its basal edge being parallel to the basal margin of the valve. The scutal margin is distinctly hollowed out, in younger specimens, however, the apex is more strongly produced than in older ones. The growth-ridges of the outer surface are only feebly developed. The articular ridge is slightly developed in the younger specimen, in full-grown specimens, however, it is somewhat more prominent. The crests for the depressor muscles can hardly be made out. The spur is confluent with the basi-scutal angle in the smaller specimens, in the larger and older ones, the basi-scutal angle is separated from the anterior margin of the spur.

The description DARWIN gives of the structure of the animal's body of the present species, is not very extensive. I therefore insert here the following details for comparison with other species.

Mouth. Labrum (Pl. XXV, fig. 7) with a not very wide, rather deep, triangular notch, and two or three teeth on each side of notch. When only two are present, the one nearer the notch may be stronger and bifid. The margins of the notch are furnished with delicate hairs or ciliae. The thickened chitinous portion that overhangs the oesophagus and represents the true labrum is quite rhombiform in this species. Its height nearly equals its breadth. Palpi strong, broad, of almost quadrate shape, only slightly swollen towards extremity and with the angles rounded off. When in rest the tips nearly touch each other in the median line. Outer surface furnished with a group of long delicate hairs, on distal part; hairs more dense towards the extremity, and reaching not quite half the length of the palpus. Upper margin with a row of shorter hairs, inner surface furnished with curved spine-like hairs which, when the palpus is not uplifted, partly overhang the crest of the labrum.

The mandible (Pl. XXV, fig. 8) has the lower part elongate and the inferior angle pointed. The 4th and 5th teeth are broad at the basis and somewhat rudimentary, the third is well-developed and double, the second also double and sharply pointed. In one of the specimens, the outer margin of the 4th tooth is dentated as in *A. conica* — but it is not so

elongate as in that species. The upper margin is more strongly convex than in the other species, the whole mandible being narrower in consequence.

The maxilla (Pl. XXV, fig. 9) is short and grows broader towards the free edge — hence this edge is rather long. There is a distinct notch under the upper pair of large spines, and there is another distinct pair of larger spines near the inferior angle. Between these two pairs, as a rule, about seven spines of smaller dimension are observed. Exceptions to this rule seem not to be rare, however: I saw a maxilla of which one (the first) of the spines of the upper pair was not developed, another with three spines of equal size at the inferior angle, a third in which the free edge was furnished with three large spines and very few smaller ones between these.

The outer maxillae (Pl. XXV, fig. 10) have the outer lobe elongate and of lanceolate shape, the inner lobe short, oval. The length of the outer lobe, in this species, is greater than in the other species I was able to compare. The hairs on the surface are delicate and numerous; those on the outer lobe form a denser tuft on the inner surface, towards the extremity and along the upper half of the inner side; a well-developed and irregularly double row of hairs extends, moreover, over the inner surface from the extremity to the upper margin of the inner lobe. The hairs seen on the inner lobe are directed towards the interior and fall over the margin of the quadrate shield-like plate with rounded angles, to which both lobes are attached. The hairs are, as a rule, very delicate, but many of them are distinctly feathered.

Cirri. Cirrus of first pair has the rami very unequal: the number of segments was found to be 9 and 21 in the smallest specimen, in a somewhat larger specimen 10 and 20, and in a much larger specimen 12 and 30. In both rami the segments are tapering towards the extremity. Those of the shorter ramus are almost all broader than long; in the longer ramus those of the basal part are broader than long, the middle ones are of a quadrate shape, the terminal ones even slightly longer than broad. The segments of the shorter (posterior) ramus have the inner face distinctly protuberant, each protuberance bearing a tuft of stronger hairs or spines on the extremity. The other hairs, disposed on the segments of both rami in the ordinary way, are rather delicate.

The cirrus of the second pair is shorter than that of the third; the rami are somewhat different in length and have 9 and 11 segments in a smaller specimen, and 12 and 16 in a larger one. Each segment bears a row of hairs along the upper margin and a tuft of such hairs on the extremity of its somewhat protuberant inner face.

In the third cirrus both rami are elongate; they have 14 and 16 segments in a smaller specimen, and 18 and 21 segments in a larger one. All the segments are nearly quadrate; those of the shorter ramus have a row of rather long hairs along the upper margin, and those of the longer ramus, a group of 3 to 4 long hairs with a few shorter ones disposed on the inner face of each segment near the extremity. The segments of the latter ramus are somewhat protuberant and on these protuberances, between the hairs, a few teeth-like pointed spines are observable.

The cirrus of the fourth pair (Pl. XXV, fig. 11) has 38 segments in the anterior ramus, and 46 in the posterior and somewhat longer ramus in the largest specimen I examined. These

segments are not very elongate, the terminal ones being only thrice as long as broad. Near the extremity the inner face of each segment is somewhat swollen; this swollen part is furnished with a group of longer hairs, representing the 2 to 3 pairs of hairs seen on the inner face of the segments of the other cirri; some of these hairs are rather long, some medium-sized, some short; each segment, moreover, bears a small group of not very long hairs on the outer face near the extremity. Finally, all the segments of both branches, with the exception of the 7 to 9 last ones, are furnished, on the somewhat swollen part of the inner face near the extremity, with a row of minute tooth-like pointed spines, which point upwards, and which are strongest on the lower segments of the anterior ramus. The second segment of the pedicel of this cirrus shows a group of 3 to 4 such teeth on the inner face near the extremity. Outer face of lower segments of both branches rough through short spines being disposed along the margin.

The cirri of the fifth and sixth pairs have the rami very elongate and composed of very numerous segments. Each segment bears a group of 3 to 5 delicate hairs on the outer face, near the extremity. The number of pairs of hairs arranged along the inner face of the segments is two in the lower and three in the upper segments. Only here and there, a fourth pair of extremely minute hairs could be seen. The teeth-like spines on the swollen parts of the segments of the 4th cirrus are represented on the 5th and 6th cirri by much smaller spines of the same shape. The outer margin of the lower segments of the 5th and 6th cirrus is distinctly rough, being furnished with one or more longitudinal rows of extremely small teeth-like spines which point upwards.

The penis is very long, distinctly ringed, tapering towards the extremity. A group of short hairs is situated at a short distance from the extremity, very few hairs only are scattered over the surface.

The only specimen of this species collected during the cruise of H. M. S. "Siboga" was taken at Station 301. Numerous and larger specimens of the same species were found by me in a collection of Cirripedia made during the fishing trips of the Inspection-Steamer "Gier" in the Western half of the Malay Archipelago. The accurate positions of these places are as follows.

Stat. 301. January 30, 1900. Lat. 10° 38′ S., Long. 123° 25′.2 E. Pepela-bay, East coast of Rotti-island. Depth 18—45 m. Bottom: mud, coral, and Lithothamnium.

H. M. S. "Gier", N° 14, Experiment 4. December 16, 1908. Lat. 3° 12′ S., Long. 116° 38′ E. Depth 25—35 m. Bottom: mud.

H. M. S. "Gier", N° 14, Experiment 7. December 17, 1908. Lat. 3° 24′ S., Long. 116° 37′ E. Depth 27—33 m. Bottom: mud.

Genus **Hexelasma** nov. gen.

Compartments six; carina, carino-lateral and lateral compartments with alae, but without radii, the rostrum having neither radii nor alae. Parietes not porose and without longitudinal ribs on their inner surfaces; basis membranous. Opercular valves sub-triangular.

Mouth with the labrum not notched in the middle; mandibles with 4 to 5 sharply

pointed teeth; maxillae with numerous spines beneath the notch; third pair of cirri resembling more those of the fourth than of the second pair. No caudal appendages. Species living in deep water.

I described, in my Report on the Cirripedia of the Challenger-Expedition[1], two species of *Balanus* (*B. corolliformis* and *B. hirsutus*), which were collected in deep water and which differed in several important points from the hitherto known species of the genus. These differences concerned partly the structure of the shell, and partly the animal's body. Since this report was issued, PILSBRY[2] published descriptions of two other species (*B. callistoderma* and *B. hoekianus*), and he pointed out that they belonged to the same section of the genus as the above-named species collected by the Challenger. The one (*B. callistoderma*) was found in Japan-waters, at a depth of 140 m., the other (*B. hoekianus*) in Behring Sea, at a depth of 77.5 m. Although PILSBRY's description with regard to the structure of the mouth, of the labrum especially, is incomplete, his species, to judge from the structure of the shell, certainly belong also to the same section of the genus *Balanus*.

I now propose to give to this section the rank of a separate genus and to give it the name of *Hexelasma*. The Siboga-material furnished me with two other species of the same group and all these species correspond in an essential point: the absence of radii and, so far as my investigations show, in a second point: viz. the shape of the labrum. The structure of the cirri of the 3rd pair, moreover, is different from that in *Balanus*; altogether, the new genus is so far a very natural one, as all the species seem closely allied in structure, in general appearance, and in the habit of living in deeper water. The relation between my new genus and *Balanus* seems to be further removed than that between *Acasta* and *Balanus*: the absence of radii in the first place, the structure of the compartments in the second, distinguishing it sharply from the true species of *Balanus*. The diagnosis given by DARWIN for the latter genus, when it comes to the point, is not applicable to these new forms; therefore we have to choose: either to extend that diagnosis, or to separate those forms from the old genus, and to establish a new genus for them. I have chosen the latter way. DARWIN, already in 1854, spoke of the large extent of the genus *Balanus* — and we have now still greater right to speak of that: if we look at the question from a practical point of view, what reason can there be to enlarge such a genus by extending its diagnosis? The very peculiar structure of the labrum and of the 3rd pair of cirri, which characterizes these new forms, shows, moreover, that the differences affect the body of the animal as well as its shell.

With respect to the differences in the animal's body, there exists a certain resemblance between the species of my new genus *Hexelasma* and those of DARWIN's Sub-Family *Chthamalinae*. The latter never have the labrum notched in the middle, and their third pair of cirri always resembles much more closely in external structure the fourth than the second pair — exactly as I found it in *Hexelasma corolliforme* and *H. hirsutum*, and as is shown in the description of the two new Siboga-species. In three species of the *Chthamalinae* belonging to two genera, there are, however, caudal appendages, and these are not found in *Hexelasma*. The corres-

[1] HOEK, P. P. C., Challenger Report. 1883.

[2] PILSBRY, H. A., Barnacles of Japan and Bering Sea. Bulletin Bureau of Fisheries. XXIX. (1909). 1911.

pondence, so far as the animal's body is concerned, is not complete, in consequence; as *Hexelasma* has the rostrum without alae, and as the *Chthamalinae* have the rostrum with alae, while it has radii rule in the *Balaninae*, the question of the position of this new genus is decidedly interesting. I feel unable, however, to settle it in a satisfactory way with the material at my disposal — perhaps younger stages of the shell of *Hexelasma* would go far to show, that its relation to one of those Sub-families was by no means so doubtful. For the present, for practical reasons only, it may remain, like *Acasta*, in the neighbourhood of the genus *Balanus*, the two genera certainly showing in several respects superficial correspondence.

This is again one of these difficult points, which the zoologist working up the material belonging to a certain group and brought home by a scientific expedition may discuss, but which can be settled only by monographical study of the whole group, and with the aid of the whole material of the group at present available. The task of a reporter, as is my case, is to give good descriptions and accurate figures: for more theoretical considerations the material handed over to him, although rich as in the case of the Siboga-Cirripedia, is obviously far too incomplete.

To judge from the six species that are at present known, the new genus has a world-wide distribution: *Hexelasma corolliforme* Hoek was dredged by the Challenger near Kerguelen (at a depth of 270 m.) and was collected again by Doflein (fide Krüger[1]) in the Bay of Sagami near Misaki; *H. hirsutum* Hoek was dredged by the Triton in the Faroe Channel (at a depth of 930 m.); *H. callistoderma* Pilsbry was collected in Japan waters (at a depth of 140 m.) and *H. hoekianum* Pilsbry in Behring-Sea (at a depth of 77.5 m.). The new species *H. velutinum* and *H. arafurae* come from the Malay Archipelago where they were found at depths varying from 204—560 m.

1. *Hexelasma velutinum* n. sp. Pl. XXVI, fig. 1—16.

Shell white, covered by a thin velvety epidermis. Alae triangular, with their summits obliquely rounded off. Orifice large, pentagonal. Inner surface of scutum and tergum white. Scutum with two longitudinal furrows, one of which is less distinct than the other; adductor ridge and cavity for adductor muscle hardly visible. Tergum only very indistinctly beaked and with the extremity of the spur truncated.

H. M. S. "Siboga" collected this species at three different Stations; unfortunately, at each station a single specimen, or one and an incomplete specimen only were dredged. The specimens from the different stations differ from one another in appearance: those from Station 59 and 201 being of a conical shape (Pl. XXVI, fig. 3 and 4), that from Station 105, however, being more cylindrical (Pl. XXVI, fig. 1), with the circumference at the basis hardly larger than at the orifice. The latter specimen is, however, unsymmetrical, the shell being considerably higher at the one than at the other side. Although there is also a small difference in the shape of

[1] Krüger, Paul, Beiträge zur Cirripedienfauna Ostasiens. Abhandl. der Math. phys. Klasse der K. Bayer. Akad. d. Wissensch. II Suppl. Bd. 6. Abhandl. 1911. p. 55.

the tergum between the specimens from the different stations, there could be no doubt that they belonged to the same species.

The shell is white and covered by a greyish membrane with a velvety surface. This membrane is quite persistent round the basal part of the shell, the surface round the orifice being almost quite bare. The orifice is large, of a pentagonal shape; it is toothed in consequence of the oblique summits of the alae. This is more distinctly the case in the specimen of cylindrical shape from Station 105. The oblique summits of the alae are delicately crenated, their surface is horizontally striated. The carina and the carino-lateral compartment have the alae, in the cylindrical specimen especially, very broad at the summit. The ala of the lateral compartment is also of a triangular shape, but it is much narrower in the upper part. The rostrum has neither radii nor alae; it is of a triangular shape, bluntly pointed at the tip, broad at the basis and very broad in the specimens from Stations 59 and 251. The outer surface of all the

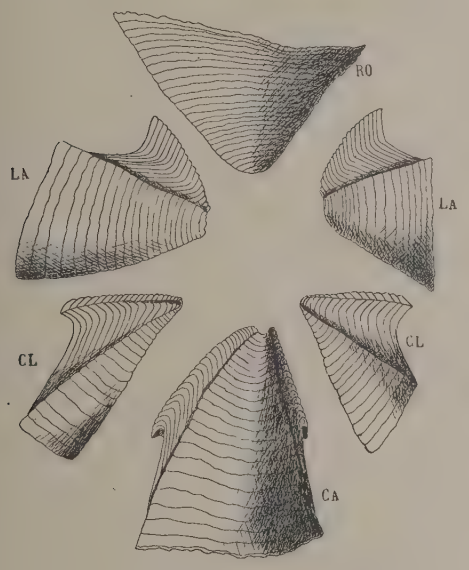

Fig. 1. Outer view of the valves of *Hexelasma velutinum* gen. et spec. nov. *RO*, Rostrum; *CA*, Carina; *LA*, Lateral; *CL*, Carino-lateral compartment.

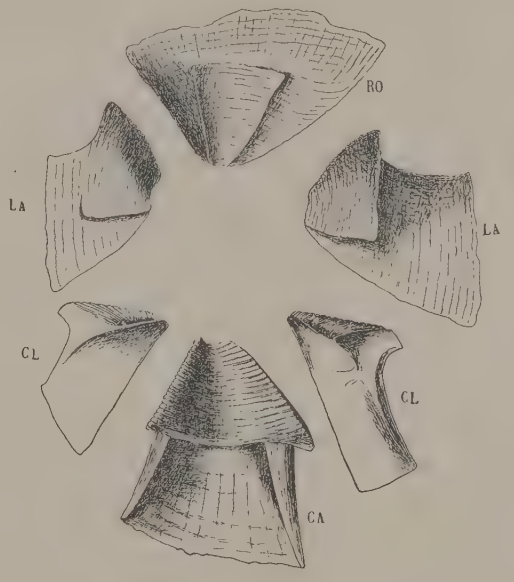

Fig. 2. Inner view of the valves of *Hexelasma velutinum* gen. et spec. nov. *RO*, Rostrum; *CA*, Carina; *LA*, Lateral; *CL*, Carino-lateral compartment.

valves is striated horizontally, the striae being more distinct on the rostrum and the carina than on the lateral compartments. On the inner surface the compartments show very delicate longitudinal lines, but these are not to be confounded with longitudinal ribs or septa, of which there is no trace. The sheath of the rostrum (Pl. XXVI, fig. 6) is developed in the middle of the valve only, the part of the valve on each side of it being slightly excavated for the reception of the alae of the rostro-lateral compartments. The compartments seem to hang together in a very loose way: on manipulating a specimen it easily falls to pieces. The basis is membranous.

With the aid of the specimen from Station 59, I was enabled to study the shape of the different valves more in detail. The accompanying figures show these, 4 times enlarged.

Rostrum almost symmetrical, moderately convex transversely, flat longitudinally; bluntly pointed at the apex and irregularly rounded at the basal margin; triangular in shape. On the inner surface, the middle part is thicker and lined on each side by a strong ridge; it reaches over the half of the height of the valve and it is distinctly striated horizontally. The lateral parts of the rostrum are also striated at the inner side, the striae are much more superficial here: these lateral parts are for the reception of the alae of the lateral compartments, the free margin of which abuts against the longitudinal ridge at the inner side of the rostrum.

Lateral compartment has an ala on the rostral side, making an angle with the valve itself, the whole being, in consequence, slightly convex transversely. Longitudinally it is nearly flat. Parietal portion about twice as wide as in the carino-lateral compartment and of a triangular shape with the basal margin straight or feebly curved, and the apex truncated. The two lateral margins of the alae form a rather sharp angle, the apex of which is only feebly truncated; the lower margin is distinctly concave and extends downwards to the basis of the compartment. The growth-lines on the alae are closely-set, extend obliquely upwards and make a curve before reaching the free margin. On the inner surface, almost at the middle of the parietal portion, a prominent longitudinal ledge extends from the apex over the middle on the one side, and not quite to the middle (on the other side) of the height of the compartment. It makes an angle with a horizontal ledge, the two ledges enclosing the part which on this valve represents the sheath.

Carino-lateral compartment has also an ala on the rostral side, which makes a very feeble angle with the valve itself. For the rest, both parts are nearly flat. The parietal portion, which is less than or a little over half as wide as that of the lateral compartment, is of an elongate-triangular shape with the apex pointed, and the basal margin almost straight. The ala has almost the same shape as that of the lateral compartment and is about as broad as the parietal portion. The free margin of the ala develops into a very characteristic rim, the growth-lines on this rim making an angle with those on the remain part of the ala. On the inner surface the part representing the sheath does not extend over the parietal portion of the valve. The growth-lines of this part are the continuation of those seen on the narrow rim along the free margin at the outer surface. The narrow continuation of the ala which goes down to the base of the valve is distinctly thickened.

Carina is nearly flat in longitudinal direction, only slightly curved outwards at the apex; it is, however, strongly bent in transverse direction. Towards the base this curvature is not so strong, the surface is here rounded in consequence; but towards the apex the lateral halves meet in a decided angle. The alae have almost the same structure and the same disposition as those of the carino-lateral compartments; they extend to the base of the valve; the latter, when seen from the inner side, presents on each side a well-developed thickened portion or rim. On that inner side the part representing the sheath is well-developed and extends over the parietal portion and over the alae as well. It is very regularly and distinctly striated horizontally. It stands off, in a very marked way, from the rest of the inner surface of the compartment.

The scutum (Pl. XXVI, fig. 2, *a* and *c*; fig. 5, *a* and *c*) is triangular, with prominent, sinuous growth-ridges and with two shallow furrows radiating from the apex of the valve. Of these the

one extending over the middle of the valve is somewhat more distinct, the other, at a little distance from the tergal margin, is faint. Basal margin slightly sinuous. On the inner surface the articular ridge is not very prominent, the depression for the adductor muscle is very superficial, and that for the depressor muscles represented only by a very shallow excavation.

The tergum is somewhat narrower than the scutum; the growth-ridges are distinct, narrower and less prominent, however, than those on the scuta. The scutal margin is straight, the carinal margin feebly curved, the basal margin distinctly hollowed out in the specimens from Stations 59 and 251 (Pl. XXVI, fig. 5, *b* and *d*) and almost straight in the specimen from Station 105 (Pl. XXVI, fig. 2, *b* and *d*). On the latter, the scutal margin of the spur is at a very short distance only from the basi-scutal angle, this distance being a trifle greater in the specimens from Stations 59 and 251. On the inner surface the articular ridge is rather prominent in the upper part, the crest for the depressor muscles, although not very prominent, is well developed. The apex of the valve develops into a very minute beak, which is a little more prominent in the specimen from Station 105.

The size of the specimens can be judged from the following:

the specimens from Station 105 are high: the largest one measures 13 mm. at the one side, and 6 mm. at the other. Its greatest diameter at the basis is 10 mm.

the specimen from Station 59 is 8 mm. high, and the greatest diameter of its basis is 12 mm.

one of the specimens from Station 251 is 7 mm. high, and the greatest diameter of its basis is 12 mm.

As regards the structure of the animal's body, I call the attention to the following points:

Mouth. Labrum somewhat thicker than in the genus *Balanus*, but it cannot be said to be bullate. No trace of notch, the upper margin being only very superficially hollowed out. This margin is armed with a row of from 45 to 60 small knob-like teeth. These teeth are of an irregular shape: they were short, conical with the apex blunt in the specimen from Station 251 (Pl. XXVI, fig. 8—10), and indistinctly double crowned (Pl. XXVI, fig. 7) in that from Station 105.

Palpi of elongately-oval shape, with the free extremity rounded. The upper margin is furnished with numerous short hairs, the outer surface with numerous longer ones, especially near the lower margin and towards the free extremity. The latter hairs form a distinct double row along — but at a certain distance from — the lower margin, extending in one of the specimens over three-fourths of its length, or, as is the case in another specimen, almost over the whole length of the palpus. The outer surface is, moreover, furnished near the distal extremity, with groups of extremely small hairs or ciliae.

Mandible (Pl. XXVI, fig. 11) has 4 sharply pointed teeth, diminishing in size from the first to the fourth, and an inferior angle terminating in 2 or 3 teeth, one of which is somewhat stronger. The distance between the extremities of teeth 1 and 2 is double that between 2 and 3, or 3 and 4. In one specimen, the space between the 4th tooth and the inferior angle is furnished with two additional pointed teeth; the dorsal or upper margin of the 3rd tooth bears in this specimen, moreover, a secondary tooth. In the second specimen (Pl. XXVI, fig. 11*) the lower margin of tooth 4 is furnished with an additional tooth. In the third, there

is a spine-like tooth in the interval between the 4th tooth and the inferior angle, and the upper margin of tooth 4 is, moreover, delicately serrated in this specimen.

Maxilla (Pl. XXVI, fig. 12) with the notch behind the upper pair of spines broad and shallow and occupied at the bottom by 4 to 5 short spine-like hairs. The part of the edge beneath the notch is somewhat oblique and furnished with 6 to 8 spines gradually increasing in length, and 4 to 6 smaller ones at and round the inferior angle (Pl. XXVI, fig. 12*).

Outer maxillae (Pl XXVI, fig. 13) have the outer lobe rounded at the extremity, its whole shape being short and broad. Hairs numerous over distal half of inner surface, and also forming a longitudinal group directed downwards. In none of the specimens a distinct separation between outer and inner lobe could be made out: so there seems to be one lobe only, which, however, at its inner and basal surface is furnished with the longer and feathered hairs that are characteristic of the inner lobe in *Balanus*.

Cirri. First pair. Rami not very unequal:

in the specimen from Station 59, number of segments 9 and 12,
in the specimen from Station 105, number of segments 8 and 14,
in the specimen from Station 251, number of segments 8 to 9, and 13.

Segments not protuberant, those of the shorter ramus with the inner faces rounded. Surface of most segments densely clothed with delicate hairs: those on the longer ramus directed mostly along the long axis of the cirrus, those of the shorter ramus standing off in different directions. A couple of spines are seen on the tip of the last segment of both rami.

Second pair. Rami nearly equal and relatively short:

in the specimen from Station 59, number of segments 11 to 12, and 11,
in the specimen from Station 105, number of segments 10 and 12,
in the specimen from Station 251, number of segments 11 and 14.

Inner faces of segments rounded, without being protuberant. Delicate hairs stand off in all directions and grow stronger towards the extremity; a few of them disposed on the extremity of the last segment look more like spines.

Third pair. Rami very unequal, the cirrus, and the longer ramus especially, looking much more like an ordinary cirrus of the 4th — 6th pairs:

in the specimen from Station 59, number of segments 16 and 21,
in the specimen from Station 105, number of segments 20 and 23,
in the specimen from Station 251, number of segments 22 and 28.

The distal part of the longer ramus is very slender; each of its segments is armed with two pairs of spines on its inner face. The lower segments bear dense bushes of spine-like hairs.

Fourth pair. Rami hardly unequal, having in the specimens from the three Stations 27 and 29, 31 and 33, and 37 and 39 segments respectively.

Fifth pair. Numbers of segments in the same specimens 29 and 31, 40 and 40, 40 and 43 respectively.

Sixth pair. Number of segments 32 and 33, 41 and 41, 42 and 43 respectively. The dorsal surface of the pedicels of the last three cirri, and that of the lower segments of the cirri also, are, in the older specimens especially, hirsute, in consequence of the presence of short

spine-like hairs all over the surface. All the segments of these cirri bear two pairs of very long spines on their inner face (Pl. XXVI, fig. 14). Between the spines of the lower pair a few very short hairs are disposed, and between those of the distal pair of spines a few somewhat longer hairs. The hairs on the dorsal surface near the extremity of each segment are relatively short.

Penis (Pl. XXVI, fig. 15) in all the three specimens examined extremely short, its free extremity not extending to the end of the pedicel of the sixth cirrus (Pl. XXVI, fig. 16). It is broad at the basis and much narrower at the extremity; this narrower part seems to be somewhat longer in the specimens from Stations 59 and 105 than in that from Station 251. The penis is finely-ringed and bears only a few hairs. A tuft of hairs is seen round the tip. No projecting point was observed at its dorsal basis.

The specimens of this interesting species were collected at the following stations:

Stat. 59. April 26, 1899. Lat. 10° 22′.7 S., Long. 123° 16′.5 E. Western entrance Samau-strait. Depth 390 m. Bottom: coarse coral-sand with small stones. One specimen, which was separated from its bottom.

Stat. 105. July 4, 1899. Lat. 6° 8′ N., Long. 121° 19′ E. Depth 275 m. Bottom: coral (a very short haul, dredge almost immediately caught in the bottom). Two beautiful white specimens attached to the surface of a piece of shell.

Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral-sand. Trawl brought up pieces of grey clay and manganese nodules, the interior of which consisted of dry clay. Two specimens, one of which was broken and loose, the other being attached to a piece of brown stone.

General Remarks. As I have pointed out already, the resemblance of the different specimens of this species collected by H. M. S. "Siboga" is not complete. There can be no doubt, however, that they belong together and that they represent a species different from those already described by PILSBRY and myself.

2. *Hexelasma arafurae* n. sp. Pl. XXV, fig. 12—16.

Alae broadly-triangular with their summits oblique. Shell with very wide orifice, dirty white, without epidermis, with obscure longitudinal stripes. Inner side of scutum and tergum orange-coloured. Scutum indistinctly folded longitudinally, with the articular ridge slightly prominent and a deep pit for the adductor muscle; tergum beaked, with prominent articular ridge and the extremity of the spur broadly rounded.

Shell (Pl. XXV, fig. 12) dirty white, compartments rather thick, massive, standing nearly vertical, hence orifice very large, diamond-shaped, somewhat narrower towards the carinal end. Outer surface of shell with horizontal and not very distinct lines of growth, slightly more distinct on the surface of the rostrum. No radii present. Alae of the carina, the carino-lateral and lateral compartments broad, triangular, with strongly marked lines of growth and the upper margin irregular, partly broken off, giving the orifice a toothed appearance. The rostrum when seen from the inner side has the sheath developed only in the middle part — whether the lateral parts represent rostral-lateral compartments cannot be made out. Parietes not porose, nor furnished with ribs at the inner side. Basis not distinct, membranous.

Scutum triangular (Pl. XXV, fig. 13 *a* and *c*) elongate, with the growth-ridges very prominent and a distinct, rather broad longitudinal furrow. On the inner surface the articular ridge is rounded, narrow, not prominent, the adductor ridge only feebly indicated and the depression for the adductor muscle very distinct, and forms a rather deep oval pit.

Tergum (Pl. XXV, fig. 13, *b* and *d*) slightly smaller than the scutum, with the apex distinctly beaked and the carinal margin rounded; the growth-ridges are much less distinct than on the scutum. On the inner surface the articular ridge is not very prominent and the crests for the depressor muscles, though distinct, not very conspicuous, nor extending beyond the basal margin. Spur broad, not very distinct, flat and rounded at the extremity. Both scuta and terga coloured brick-red on the inner surfaee.

Mouth: labrum (Pl. XXV, fig. 14) swollen, especially laterally where the palpi are attached; edge hollowed out but without a central notch. It is furnished with very delicate hairs in the middle and has small teeth on both sides; of these, several are bifid or even trifid at the apex. Palpi large, broad, rounded at the apex, with long curved hairs disposed along the margin and on the outer surface, and numerous shorter ones along the upper margin. The palpi nearly touch one another in the middle of the labrum.

The mandible (Pl. XXV, fig. 15*b*) has four teeth, and the inferior angle armed with a single point and a series of short hairs — not pectinated as it commonly is. The upper or dorsal side of the 3rd and 4th teeth and of the inferior angle with 2 or more very small accessory teeth; (the mandible of the other side (fig. 15*a*) somewhat abnormal in the specimen which was examined: the four teeth pointed, and standing close together, the inferior angle longitudinally extended with two steps and a terminal angle.

The maxilla (Pl. XXV, fig. 16) can hardly be said to have a notch beneath the upper pair of spines. Beneath these two upper spines, 4—5 smaller spines are observable and beneath them there is an indication of a notch, being the upper limit of the somewhat step-formed projection which represents the remaining part of the edge of the maxilla. This part of the edge is furnished with 16—20 nearly equally stout spines, of which the 4—5 last ones are somewhat shorter and less strong.

The outer maxillae have the inner surface bilobed, but only very indistinctly.

Cirri. First pair short, with the rami distinctly unequal in length: the longest having 14 segments, the shorter 10. The lowermost segments of the longer ramus are broader than the uppermost, as are also those of the shorter ramus. All the segments have the surface thickly clothed with spines, the upper ones, however, in a less degree than the lower segments.

Second pair, with the anterior ramus having 12 slightly broader segments, and the posterior 15 slightly narrower segments, all thickly covered with spines.

Third pair, with the rami very unequal, composed of 19 and 43 segments respectively. In both rami, the 14—15 lower segments thickly covered with spines. The four remaining segments of the anterior (shorter) ramus have two (or three) pairs of spines on their inner face and a group of two or three spines at the posterior margin near the extremity. The posterior (longer) ramus shows the same two pairs of spines, with the small bristles situated between the two of each pair, which are seen on all the segments of the 4th—6th cirrus, only on the

15th—24th segments. The 25th—43rd segments are not furnished with these spines, but their armature consists of 6—8 bristles situated near the extremity of each segment and giving the extremity of this ramus the appearance, more or less, of an antenna.

The 4th—6th cirri have long rami of nearly equal size, of numerous but not elongate segments. In the specimen that was examined the number of segments was 30 and 37 in the 4th cirrus, 38 and 40 in the 5th, and 39 and 41 segments in the 6th cirrus. The segments are almost without exception furnished with two pairs of very long, stiff, needle-like spines along their inner face, at the base and between which two or three very short bristles are regularly inserted.

The penis is very short, distinctly ringed, considerably broader near the basis, with the terminal part cylindrical, recurved and rounded at the extremity. Delicate hairs are scattered over its surface; they form a dense group of minute bristles near the extremity.

The specimen that served for the above description was taken at:

Stat. 262. December 18, 1899. Lat. 5° 53′.8 S., Long. 132° 48′.8 E. Depth 560 m. Bottom: solid bluish grey mud.

The specimen was found attached to a piece of grey granitic stone; a small specimen of *Verruca capsula* was found attached to the surface of one of the parietes (the left-hand carino-lateral compartment).

General Remarks. This species, though in several respects approaching the new species *H. velutinum*, is easily distinguished from that and other species of the genus observed in the Malay Archipelago and elsewhere by the thickness and bareness of its shell, and the shape and colour of the opercular valves.

Genus **Tetraclita** Schumacher

The species of this genus inhabit the tropical and warmer temperate seas, and are found attached to tidal rocks, shells, pieces of stone, wood, etc. They live only in shallow water: dredging in deeper water has never yielded any form belonging to this genus.

The eight species of this genus which Gruvel enumerates in his "Monographie" (1905) are exactly the same as those of Darwin's Monograph (1854). Nor has our knowledge regarding the distribution of these species been greatly enlarged since Darwin's work appeared, although, on several occasions, one or more species were collected by different naturalists.

Also in the Malay Archipelago and adjacent waters various species have since been met with; I give here a list which, though perhaps not quite complete, may fairly well summarize our knowledge at the present time.

Tetraclita porosa (Gmel.), according to Weltner[1], was collected at different places in the Indo-Polynesian Region, the Berlin Museum has specimens from Singapore, Amboina, Zamboanga, Borneo, etc.

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[1] Weltner, W. Verzeichnis der recenten Cirripedienarten. Arch. f. Naturgesch. Jahrgang 1897. Bd. I. S. 227—280.

Tetraclita porosa var. (1) *communis*, according to GRUVEL [1], is represented in the Calcutta Museum by specimens from Muscat (Arabia).

Tetraclita porosa var. (3) *viridis*, according to BORRADAILE [2], was collected by STANLEY GARDINER at Rotuma, N.N.W. of the Fiji Isds.

Tetraclita porosa var. (4) *rubescens*, according to WELTNER [3], is found at Nagasaki.

Tetraclita porosa var. (7) *patellaris*, according to GRUVEL [1], was collected in the Bay of Bengal, near the Andaman Isds.

Tetraclita serrata Darwin, according to ANNANDALE [4], was found off Ceylon, on a dead *Heteropsammia*.

Tetraclita rosea Darwin, according to WELTNER [3] and myself (Challenger-Cirripedes) occurs on the coast of New South Wales.

Tetraclita purpurascens (Wood), according to WELTNER [5], was collected by SCHAUINSLAND in Cook Strait (New Zealand) and is also represented in the Berlin Museum [3] by specimens from Auckland and New South Wales.

Tetraclita costata Darwin, according to WELTNER [3], was collected at Larentuka.

Tetraclita vitiata Darwin, according to the same author [3], was also collected at Larentuka.

Tetraclita coerulescens (Spengler) which the Challenger collected at Zamboanga (Philippines), occurs also, according to WELTNER [3], at Amboina, Larentuka and Singapore.

If we take the sixth Province with the limits as proposed in my Challenger publication, the number of species there occurring would be five: *T. porosa*, *serrata*, *costata*, *vitiata* and *coerulescens*. *Tetraclita porosa* would, moreover, be represented in the said province by the var. (7) *patellaris*, this variety being found in the Bay of Bengal.

This genus is represented by four species in the collections made during the cruise of H. M. S. "Siboga": *T. porosa* (Gmelin), *T. costata* Darwin, *T. vitiata* Darwin and *T. coerulescens* (Spengler). They were collected on tidal rocks, during reef exploration, etc.

1. *Tetraclita porosa* (Gmel.).

DARWIN, CH., Monograph. The Balanidae, Verrucidae, etc. 1854. p. 329, pl. X, fig. 1*a*—1*m*.

This is a very common species with a wide distribution. It varies greatly in external appearance and DARWIN therefore distinguished eight varieties, some of which, however, differ only in the colour of the preserved portions of the outer lamina of the shell. As this colour no doubt suffers considerably under the influence of the spirits in which the objects are preserved, in many cases it is hopelessly difficult to make out whether they belong or not to one of these varieties.

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[1] GRUVEL, A., Cirrhipèdes operculés de l'Indian Museum de Calcutta. Memoirs of the Asiatic Society of Bengal. II. N° 1. p. 1—10. 1907.

[2] BORRADAILE, L. A., On some Crustaceans from the South-Pacific. Part V. Proceed. of the Zoolog. Soc. of London. 1900. p. 795—799.

[3] WELTNER, W., Verzeichnis der recenten Cirripedienarten. Arch. f. Naturgesch. Jahrgang 1897. Bd. I. S. 227—280.

[4] ANNANDALE, N., On the Cirripedia. In: W. A. HERDMAN's Report on the Pearl Oyster Fisheries of the Gulf of Manaar. 1906.

[5] WELTNER, W., Cirripedien der Ergebnisse einer Reise nach dem Pacific. Zoologische Jahrbücher. XII. 1899. S. 441—447.

The specimens collected by H. M. S. "Siboga" are from three different Stations, and have a greenish-grey colour in the preserved condition. The outer lamina are only partly removed in the younger specimens, much more so in the larger specimens. The size and shape of the shells is rather different, radii are distinct in some specimens and hardly distinguishable in others; some have very small orifices, others much larger ones. But the shape and structure of the opercular valves is the same or nearly the same in the different specimens; they closely resemble the figures and correspond to the description given by DARWIN.

The most typical specimens among those of H. M. S. "Siboga" were collected at Station 152 during reef-exploration. According to the list, the depth at that Station was 32 m. and the bottom was covered with *Lithothamnium*. The shape of these specimens is conical, their colour greenish-grey, the exposed parietal tubes dark, nearly black. The orifice is irregularly rounded and large, the sutures of the compartments are not quite distinct, much more distinct, however, in one of the specimens, than in the others. A narrow but distinct radius is represented almost at every suture in this specimen. The diameter of the largest specimen was 38.5 mm. at the basis; the thickness of the wall was here about 8 mm. The opercular valves of one of these specimens were carefully cleaned, and found in perfect agreement with DARWIN's description, not considering little differences in colour, and in the degree in which the basi-tergal angle of the scutum is rounded off, etc. In this specimen, the adductor ridge of the scutum extends quite to the apex of the valve, as DARWIN says it does in some specimens. Its tergum has a distinct beak, the spur is quite close to the basi-scutal angle and its extremity is pointed, perhaps not quite so sharply as DARWIN says it is in one of the varieties, but sharper certainly than in the two forms figured by DARWIN.

This form comes nearest to *T. porosa* var. (3) *viridis* of DARWIN; the inner surface of the opercular valves, however, is not "clouded green" as DARWIN said, but rather bluish-black. These specimens were collected during reef-exploration at Wunch-bay, N.W.coast of Waigeu-island [Station 152, August 12/13, 1899.] (Note. A sample of specimens collected during the New-Guinea-Expedition of 1903 (February 13th) in the Bay of Mawi corresponds in most respects to those of Station 152.)

In the second place, there are specimens from Station 131. They are much smaller than those from Waigeu-island and form two clusters of 7 to 9 specimens each. Their shape is not conical, but some are depressed, others rather globular with relatively small orifices. The surface is irregularly ribbed, the ribs more or less distinctly serrated near the base. The outer lamina of the shell is quite preserved in some specimens, in most removed near the orifice; the colour of the specimens (in preserved condition) is greyish-green and the parietal tubes are blackish where exposed. Radii and sutures very indistinct. Size: largest diameter of the basis 12 to 16 mm., height 7 to 9 mm. The opercular valves are much like those of the specimens from Station 152, the scutum having the adductor ridge extending to the apex of the valve, and the tergum being beaked and having the spur quite close to the basi-scutal angle. The extremity of the spur, however, is more bluntly pointed.

This form resembles *T. serrata* Darwin, to a certain extent; on the other hand it is so much like a true *T. porosa* that it seems impossible to separate it from that species.

DARWIN pointed out that his *T. serrata* was more closely related to *T. porosa* than to any other species. He would not, perhaps, have separated the two forms from each other as distinct species, if he had met with the specimens collected by the Siboga. They were found at the anchorage of Beo, Karakelang-islands (Station 131, July 24/25, 1899) when the reef was explored.

The third lot of specimens belonging to this species is from the neighbourhood of Station 225. It consists of only two individuals: one loose, one attached to a piece of calcareous rock. The shape of these shells is conical, the colour greenish-grey. The surface is irregularly ribbed and shows the extremely narrow parietal tubes extending from the orifice almost to the base. The shape and structure of the opercular valves of these specimens correspond in general to those of the specimens of the other lots; yet the tergum has the spur relatively larger, and the curved carinal margin shorter than is the case in the other specimens. According to the label, this lot was taken near Station 225, 5700 m. to the N.E. of Southpoint of South Lucipara island. Here the depth was 894 m. The specimens of *Tetraclita porosa* were not taken at that depth, but were found attached to a piece of coralline stone taken from the reef.

2. *Tetraclita costata* Darwin.

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 339, pl. XI, fig. *2a—2c*.

Four to five small specimens of this species were found attached to a piece of stone collected on Banda Reef, at the end of November, 1899. DARWIN knew it from the Philippine Archipelago, and WELTNER saw specimens from Larantuka.

The specimens from Banda Reef are no doubt young ones. The greatest diameter of the basis of the largest specimen measured only 7 mm.

3. *Tetraclita vitiata* Darwin.

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854, p. 340, pl. XI, fig. *3a—3e*.

A single specimen was collected on the reef of South Lucipara island. It has the irregular surface, the very irregular parietal tubes, and the moderately wide radii as in DARWIN's definition of the species. The shape of the tergum and scutum is, moreover, exactly as in the figures given in DARWIN's Monograph. In the carina, some of the tips of the upfilled parietal tubes are exposed and these give a reddish-purple tinge to the uppermost part of that valve. The only specimen is medium-sized, the dimensions of the basis being $14 \times 12^1/_2$ mm., the height measuring 7 mm.

This species, which was described by DARWIN from specimens from the Philippine Archipelago and from Barrier Reef (Raine's Islet), Australia, was, according to WELTNER, collected also at Larantuka. The Siboga collected it on the Lucipara-islands (about Station 225), which lie in the Banda Sea, during reef-exploration.

4. *Tetraclita coerulescens* (Spengler).

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854, p. 342, pl. XI, fig. 4*a*—4*d*.

A depressed-conical, rather large specimen of this species was taken at Banda when the reefs were explored. Its surface is strongly corroded, the longitudinal ridges are here and there visible, and a good deal of the infilled parietal tubes are exposed. The colour is greenish-blue, and whitish between the darker spots and ribs. The shape of the basis is irregularly oval, its longest diameter measures about 40 mm.

The structure of the inner side of the scutum is so characteristic that no doubt remained as to which species the much-corroded specimen belonged.

This species seems to occur at different places in the tropical Eastern Seas: Pacific Ocean and Philippine Archipelago (DARWIN and "Challenger"), Amboina, Larentuka and Singapore (WELTNER), Banda ("Siboga").

Genus **Pyrgoma** Leach

DARWIN (1854) enumerates and describes 9 species of this genus, and no new species have been added to the list since the publication of his Monograph. WELTNER[1] (1897) pointed out that a *Pyrgoma* collected (in 1874) by HILGENDORF in the Bay of Yeddo (Japan), though nearly related to *P. cancellatum* (Leach), differs from that species in several respects, and was, in consequence, considered by him as forming a variety for which he proposed the name *P. cancellatum* var. *japonica* Weltner. The author intended to give a full description with figure of this variety, but, so far I know, it has not as yet been published.

Nor has our knowledge with regard to the geographical distribution of the other species of this genus made great advances, the different cases mentioned by WELTNER in his "Verzeichnis" being the only ones which came to my knowledge.

Therefore we only know of the following species as occurring in the 6th Province, including the Malay Archipelago:

Pyrgoma anglicum Sowerb. Singapore, according to WELTNER.

Pyrgoma grande (Sowerb. Jr.) Singapore and East Indian Archipelago (DARWIN), Birara (Neu Pommern) (WELTNER).

Pyrgoma milleporae Darwin. Philippine Archipelago (DARWIN), Birara (Neu-Pommern) (WELTNER).

Pyrgoma crenatum Sowerb. Philippine Archipelago, Singapore (DARWIN), New Guinea (WELTNER).

Pyrgoma monticulariae J. E. Gray. Singapore (DARWIN).

During the cruise of H. M. S. "Siboga" specimens of three species of *Pyrgoma* were collected in the Malay Archipelago: one sample consists of numerous specimens of *Pyrgoma*

[1] WELTNER, W., Verzeichnis u. s. w. Archiv f. Naturgeschichte. 1897. Bd. I. S. 227—280.

grande Sowerb. Jr., but the exact place where they were collected is not given; the second is represented by two specimens and is a new species for which I propose the name *P. kuri* after the island in the neighbourhood of which, at a depth of 200 m., it was collected: so far as I know this is the first instance of a species of this genus being found at such a great depth. The third species of the Siboga collection is also new to science. I wish to introduce it into the system under the name of *P. jedani*, again after the island where it was collected. Both new species are very characteristic, and will be easily distinguished from DARWIN's species, should they again be found.

The number of species occurring in the Malay Archipelago has now increased to seven; some of them at least seem to have only a local distribution, and perhaps other species may still be found should more remote parts of the Archipelago be carefully explored.

About the bathymetrical range of the species of this genus, we are not well informed at present. Most specimens were collected during coast-exploration, most species seem only to occur in shallow water. Probably this is also the case with two of the species represented in the Siboga-collection: viz. *P. grande* Sowerb. Jr., and *P. jedani* n. sp. The third (*P. kuri* n. sp.) was dredged at a depth of 204 m., which certainly shows that their occurring in shallow water is a rule not without an exception.

1. *Pyrgoma grande* (Sowerby Jr.).

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 365, pl. XIII, fig. 1*a*—1*d*.

About half-a-dozen specimens of this species were collected during the cruise of H. M. S. "Siboga". Unfortunately the station where this species was collected has not been noted, the label bearing only a query— a very great exception in the case of this expedition.

The appearance and structure of shell and basis much resemble the description as given by DARWIN. DARWIN, however, complained that the internal organs of most species of *Pyrgoma* are badly preserved, and, in consequence, has only been able to investigate the structure of the mouth and the cirri of *P. anglicum*, *P. milleporae* and *P. crenatum*. Just to compare the structure of these parts in *P. grande* with those of my new species *P. kuri*, I dissected one of the specimens; and as the structure of the said organs was found to be of some interest, I will insert here the following description:

Mouth. Labrum deeply and widely notched; a large number of small triangular and pointed teeth arranged in several rows on both sides at the entrance of the notch. Palpi stout, broad, short, with the tip rounded and with numerous shorter hairs disposed along the inner surface, longer ones at the tip, and very long but not very numerous ones near the extremity of the upper margin.

Mandible with four teeth, and the inferior angle not produced; the latter has a series of small triangular, partly blunt and partly pointed teeth along the anterior margin; in the mandible of the left side, one of these teeth is developed somewhat more strongly and might be considered as a fifth mandibular tooth. The first tooth is single, relatively short and pointed,

teeth 2 and 3 are laterally double, and tooth 4 which is single has two smaller teeth situated near its base.

Maxilla with the edge nearly straight, a rudimentary notch in which two hairs are disposed under the two larger upper spines, and a dozen somewhat smaller spines varying in length, along the remaining part of the edge; near the lower angle a group of half-a-dozen hairs occupy the lowermost part of the edge. Numerous hairs are disposed on the surface of the maxilla and near the outer edge, extending to between the spines along that edge.

Outer maxillae distinctly bilobed; upper lobe broadly-oval, with a very dense tuft of curved hairs disposed at the tip and over the inner half of the surface; inferior lobe elongate, with the inner margin convex and hairs covering only the inner half of the surface.

Cirri. Cirrus of first pair with very unequal rami, the longer ramus having 19, the shorter only 7 segments; in both rami the lower segments are much broader than the more distal ones: hence the shape of the whole ramus is elongately-conical. The segments of the longer ramus are in general short, only slightly increasing in length towards the extremity; those of the shorter ramus are all of about the same length. The length of the shorter ramus is more than half the length of the longer. A great number of the spines, on the 4 to 5 lower segments, are disposed in both rami on a swelling of the surface situated near the distal extremity of each segment.

Cirri of the second and third pairs of about the same structure, which is quite different from the 4th to 6th cirrus. The second has 8 and 9, the third 10 and 13 short quadrate segments which are slightly swollen near the distal extremity, and are somewhat narrower near their basis. A group of larger spines is situated on the swelling at the inner side and near the upper margin, a very dense bush of shorter and stronger spines on the swelling at the outer side of each segment.

The 4th to 6th cirri have elongate segments; only one of the pairs of spines disposed in the ordinary way along the inner margin of each segment is well developed: the spines of this pair are long but relatively delicate. Yet a second pair of very small spines and a third pair of quite rudimentary ones can be made out as a rule. The number of segments is very large: 29 and 33 for example in the 6th cirrus of the specimen I dissected.

The penis is very long and grows narrower towards the free extremity; it is composed of numerous short rings, and it has short hairs scattered nearly over the whole length.

The small straight projecting point at the dorsal basis of the penis is relatively large, curved at its dorsal side and has a blunt, not pointed tip.

2. *Pyrgoma kuri* n. sp. Pl. XXVII, fig. 1—2.

Shell short-cylindrical, with the upper part feebly conical, coloured greenish-brown; orifice elongately-oval, narrow; scutum and tergum calcified together, a suture showing their limits; scutum with a prominent occludent ledge and a well-defined adductor plate, tergum well-developed, with the spur longer than the remaining part of the valve.

Surface of the shell granulated (Pl. XXVII, fig. 1), with indistinct furrows which extend irregularly over the lower, wider and cylindrical part of the shell, and which radiate from the orifice in the upper, slightly narrower part. In consequence, the orifice is surrounded by a circle of small areas, which are separated from each other by the furrows and which are of a lighter colour, the remaining part of the shell being of a darker, greenish-brown colour. The orifice is elongately-oval, not quite three times as long as broad, small; its carinal extremity rounded, the rostral one being pointed.

Shell thick, having small and not very distinct pores at irregular distances in the outer layers and having the internal surface strengthened by vertical septa. Sheath not large, extending only to the point where the conical and vertical parts of the compartments meet. Basal part of shell only very superficially embedded in the surface of the coral in one specimen, and much more distinctly, especially at the carinal extremity of the shell, in the other.

Size of the largest specimen 10 mm. in its longest diameter, of the smallest 7 mm.

The scutum and tergum (Pl. XXVII, fig. 2) are closely united, and even calcified together in the specimen I dissected. The line of junction between the two makes a not very sharp angle with the strongly curved occludent margin of the scutum. This valve is not very elongate, being slightly more than twice as long as the height near the line of junction. The scutum narrows towards the rostral end, where the basal and occludent margins meet in a somewhat produced angle. Along the occludent margin there is a strong ridge or ledge which bends inwards. The basal margin is concave, the adductor ridge developed into a rather broad plate, which projects considerably below the basal margin.

The tergum is relatively large, its surface being hardly smaller than that of the scutum; spur well-developed, with the extremity bluntly pointed. Crests for the attachment of the tergal depressor muscles distinct and projecting beyond the basal margin.

The study of the structure of the animal contained within the shell has yielded the following results:

Mouth. Labrum deeply and widely notched; a pair of very small triangular teeth, and numerous short and stiff hairs on both sides of the notch. Palpi stout, short and broad, with the lower margin straight and the upper rounded; along the lower margin shorter hairs are observable, longer ones at the tip, and very long and strongly curved hairs at and near the upper margin; the hairs at the tip are so densely disposed as to form a distinct tuft.

Mandible with five teeth, and quite a rudimentary inferior angle terminating in a group of very small, pointed teeth. The first tooth is relatively short and single, the second and third teeth are distinctly double, teeth four and five standing close together, short, broad and blunt. Hairs along the posterior margin of the inferior angle not very numerous, standing close together and being relatively strong.

Maxilla short, with the edge rather long and perfectly straight and with the upper and lower margins nearly parallel. Nine spines are seen along the edge; only the two superior ones are broader and slightly longer than the others; a very rudimentary notch is observed under the two superior spines; between the spines a number of delicate hairs are seen.

Outer maxilla distinctly bilobed; upper lobe broad, almost quadrate, outer margin rounded, inner margin straight; hairs situated near the extremity and over the inner half of the surface; inner lobe short, with not very numerous hairs over the inner half of its surface; opening of the segmental-organ not at the end of a projection, but at the surface of the basal part of the maxilla.

Cirri. Cirrus of first pair situated near the mouth and having the longer ramus twice as long as the shorter; the latter has 6, the former 11 segments. The form of the segments is nearly quadrate, with the inner margin rounded. The relatively long spines are arranged on the longer ramus in two transverse rows, near the extremity of each segment; they are distributed on the shorter ramus in more irregular groups over the whole surface of each segment.

Cirrus of second pair with slightly unequal rami of 7 and 8 segments; all the segments distinctly protuberant at the inner side. The whole surface of the segments is covered with rather long and thin straight spines, those at the outer side near the extremity of the distal segments and at the tip of the last segments of both rami being somewhat stronger.

Cirri of third pair of the same type as those of the first and second pairs. Number of segments in the two rami 8 and 9. Inner side of segments less protuberant than in the cirrus of the second pair. Hairs on the surface of most segments numerous and thin, forming a more dense central tuft, and radiating from there in all directions.

Cirri of fourth-sixth pairs not very elongate and composed of

16—17 segments in the fourth cirrus,
18—19 segments in the fifth cirrus, and
20—21 segments in the sixth cirrus.

Most segments bear, on their inner face, three pairs of spines, the lowest of which is much smaller, and as a rule a fourth pair of quite rudimentary spines. The segments grow longer and narrower towards the distal extremity of the ramus, the longest being about two and a half times as long as broad.

Penis remarkably long, more than three times as long as the sixth cirrus, tapering towards the extremity, with short hairs here and there, and a circle of such hairs round the extremity.

The small and straight projecting point at the dorsal basis of the penis, known to DARWIN already as occurring in the species of this genus, is well-developed also in the present species. Its apex is sharply pointed.

Two specimens of this species were found attached to a coral (*Caryophyllia* sp.) which was collected at:

Stat. 251. December 8, 1899. Lat. 5° 28′.4 S., Long. 132° 0′.2 E. Depth 204 m. Bottom: hard coral-sand.

General Remarks. Although it has not been possible, from want of material, to give the description of this species so detailed and so accurate, as might be desired, especially as regards the structure of the shell, the sheath, the basis etc., there can be hardly any doubt as to its being different from any of the species described by DARWIN.

It is, moreover, the first instance of a species of *Pyrgoma* being found at a somewhat considerable depth.

3. *Pyrgoma jedani* n. sp. Pl. XXVII, fig. 3—8.

Shell irregularly conical, orifice oval, with a somewhat swollen border; basis irregularly cup-formed and attached to the surface of the ramifications of an Alcyonarian; scutum and tergum triangular, not calcified together; spur of tergum feebly developed.

Of this very interesting new species (Pl. XXVII, fig. 3), numerous specimens are attached to an Alcyonarian from Station "Jedan". They look as if they formed one organism together with the Alcyonarian; the smaller specimens of the Cirripede especially can hardly be distinguished from swollen parts of the branches of the Alcyonarian. The large specimens have their surfaces also quite merged into that of the organism to which they are attached, and the ramifications of the latter seem to loose themselves in the surface of the Cirripede.

Some of the Cirripedes are attached to one another, and in this state have a very irregular shape. Most specimens show more or less distinctly a somewhat laterally flattened conical shell and an irregularly cup-formed basis. Where shell and basis unite, a more or less prominent border or margin can be distinguished, and, in some of the specimens, rims or lists run from that border to the orifice of the shell. This orifice is moderately large and has a swollen border, which is distinctly divided into parts or lobes in some of the specimens. In several specimens, more or less deep furrows extend over the surface of the shell, parting from the orifice, and dividing the shell into parts which at first sight might be compared with the compartments of other sessile Cirripedes. The surface is irregular, moreover, through the presence of numerous tubercles or knobs, which, however, are also much more numerous and prominent on some of the specimens, than on the others.

The opercular valves are not calcified together and, in many regards, resemble those of *Balanus*. The scutum (Pl. XXVII, fig. 4, *a* and *c*) is rather thick, triangular, with the apex pointed but not produced, and with the basal margin distinctly curved; the articular ridge is strongly developed and extends to the basi-tergal angle of the valve; the part of the valve along the tergal margin is distinctly reflexed. This is also the case with the part of the valve along the occludent margin. The inner surface of the valve is almost perfectly smooth, no trace of an adductor pit or adductor ridge being visible; a lateral depressor pit, however, can be seen at the basi-tergal corner of the valve. The outer surface of the scutum shows prominent growth-ridges; the whole valve is not flat, but distinctly bowed along a line extending from the apex to a point near the middle of the basal margin.

The tergum (Pl. XXVII, fig. 4, *b* and *d*) is almost quite flat, thin, triangular. Its apex is rounded and not beaked; growth-ridges on the outer surface very indistinct. The scutal margin is nearly straight, the carinal bowed, the basal sinuous. The spur is only feebly developed and represented by a part with rounded circumference which projects a little beyond the basi-scutal angle of the valve. On the inner side the growth-ridges are slightly more distinct than on the outer surface. There is a slightly-prominent articular ridge and furrow,

and traces of crests for the attachment of the tergal depressor muscle can be seen near the basi-carinal angle of the valve.

The study of the structure of the animal contained within the shell has given the following results:

Buccal process not very prominent; at its side the cirri of the first pair are attached; labrum (Pl. XXVII, fig. 5) widely and also deeply notched, with three small triangular teeth on each side of the notch. Palpi broad, rounded, with numerous and not very long, partly curled hairs disposed on the inner surface and along the upper margin.

Mandibles (Pl. XXVII, fig. 6) with five teeth and the inferior angle not distinctly separated from the fifth. Distance between tips of first and second teeth slightly surpassing that between those of second and third teeth. The third tooth is the most massive, the fourth and fifth are smaller than the others. The second and third teeth are laterally double.

The maxilla (Pl. XXVII, fig. 7) has a straight edge; below the two larger upper spines there is a rudimentary notch; on the part of the edge below this notch 7 to 8 spines are disposed, one or two of which are almost as strong, and only a trifle shorter than the two upper ones.

The outer maxillae (Pl. XXVII, fig. 8) are bilobed; the inner lobe is small, the outer rather broad and of an oval shape. Numerous hairs are disposed along the inner margin and on a part of the surface, towards the interior of the mouth.

Cirri. Those of the first pair have very unequal rami of twelve and six segments. In both rami hairs are disposed in dense groups at the front side on the upper half of the surface of each segment. That part of the surface of the segments of the shorter ramus on which the hairs are disposed is slightly protuberant.

The cirri of the second and third pair have about the same structure, the latter being only slightly longer than the former. The rami of the second cirrus have 6 and 8 segments, the longer ramus having its segments slightly more protuberant than the six segments of the shorter. The hair-like spines on the segments of the 2nd cirrus are much longer and form denser bushes than those of the 3rd cirrus. The latter has 7 segments in the shorter ramus and 8 in the longer.

The cirri of the 4th to 6th pairs have the rami rather short. Those of the 6th pair have eleven and twelve segments, the first of which is very long, the following being about two and a half times as long as broad. The number of pairs of spines on the inner face of each segment is three, the first or lowest pair being extremely small.

The penis is extremely long, tapering towards the extremity, with delicate hairs scattered over its surface and a few more disposed near the extremity.

The straight projecting point at the dorsal basis of the penis is well developed; it is slightly curved, but its apex is not pointed, but blunt.

One of the specimens I examined was furnished with eggs. As far as could be made out, they were united into a cluster (and only in one) and did not form true lamellae. The eggs are not very numerous (about 60 to 80 altogether) and relatively small: they measure only 0.27×0.14 mm.

This species was collected at Station Jedan. As the figure (Pl. XXVII, fig. 3) shows, the Cirripedes are attached to a much ramified Alcyonarian Polyp, the name of which I have not been able to make out.

General remarks. This is a very peculiar species: in the first place it is a *Pyrgoma* with the opercular valves of a *Balanus*. In three of the hitherto known species of *Pyrgoma* (*P. conjugatum*, *P. grande* and *P. monticulariae*) the scuta and terga are perfectly calcified together, and this is also the case with the opercular valves of *P. kuri*; in a fifth species (*P. milleporae*) these valves are slightly calcified together, the scutum being, moreover, much elongated; the scutum of *P. dentatum* and *P. crenatum* is much elongated all the same; an abnormal long spur — four times as long as the upper part of the valve — characterizes the tergum of *P. cancellatum*; sub-triangular scuta and terga, like those of *Balanus*, occur only in *P. anglicum* and *P. Stokesi*, two species approaching each other closely and both belonging to the Atlantic region. Comparing these valves of *P. anglicum* with those of *P. jedani*, we see at once that the scutum of the latter, with its feebly developed ridges and the indentation of the basal margin representing the cavity for the lateral depressor muscle, is quite different, and that the spur of the tergum which is well-developed in *P. anglicum*, can hardly be made out in the new species.

In the second place, the general shape of the shell and the way in which it is attached to the Alcyonarian is also quite peculiar. In this respect also it comes perhaps nearest to *P. anglicum*, but nothing can be made out in the new species of the pores which permeate the basis in that species.

Thirdly, I must point out that its attachment to an Alcyonarian and not to a coral is, so far I know, characteristic for the present species, all the others living, as Darwin says, "imbedded in corals".

Genus **Creusia** Leach

Darwin thought best to describe the different forms of Cirripedes belonging to this genus, not as different species, but as so many varieties of a single species. According to him the variations are local, the greater number of specimens embedded in the same coral resembling each other. Of these varieties, to which Darwin has given no names, and of which he distinguished no less than eleven, according to him several inhabit the Malay Archipelago: Java, the Philippines, Singapore, etc.

This species lives attached to or embedded in corals, and has not been observed hitherto at any considerable depth. It is distributed "throughout the tropical seas" (Darwin); but, partly in consequence of the insufficiency of the available material, our knowledge of the distribution of these different forms is still a very incomplete one. Weltner[1] gives a list of the localities from which the Berlin Museum has received samples of *Creusia spinulosa* — but as he does not say to which varieties or forms these samples belong, his list does not enlarge our knowledge very much.

[1] Weltner, W., Verzeichnis u. s. w. Archiv f. Naturgeschichte. 1897. Bd. I. S. 255.

The genus is represented in the collections of the expedition of H. M. S. "Siboga" by only two samples, and each consists of only a single specimen, being one moreover, incomplete.

1. *Creusia spinulosa* Leach, var. (11).

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 376, pl. XIII, fig. 6, pl. XIV, fig. 6.

I refer to this species, although with some hesitation, a specimen of a Sessile Cirripede attached to and partly embedded in a piece of plate-like coral which was dredged at:

Stat. 257. December 11, 1899. In Du-roa-strait, Kei-islands. Depth till 52 m. Bottom: coral.

There is one specimen only, and this is incomplete as the opercular valves are wanting. Its orifice is small diamond-shaped, it has four compartments and distinct white radii, the remaining part of the shell being pale lilac-coloured. Its surface is not very distinctly marked with ribs, but shows numerous calcareous points which are disposed, somewhat irregularly however, on rows radiating from the orifice to the edge of the basis. The shell is of a conical shape and small, the greatest diameter of the basis being about 6 mm.

2. *Creusia spinulosa* var. *sumbawae* n. var. Pl. XXVII, fig. 9—16.

This variety is different from those described by DARWIN; it is not embedded in a coral, but was found attached to a specimen of *Heteropsammia* (Pl. XXVII, fig. 9). Its shape is conical, its orifice small, elongately rhombiform; the surface of the compartments is rough (Pl. XXVII, fig. 10) through numerous small pointed tubercles being scattered over it. The colour is yellowish-brown, the radii and the basal parts of the ribs being white; the small tubercles on the surface are also of a white colour. The radii are rather broad at the summits, which are horizontal, not oblique. The surface shows the ribs round the basis much more prominent on one side than on the other: whilst they can hardly be seen on one side, they are distinctly projecting round the basal border on the other side. The basis is distinctly cup-formed, and its outer surface shows ribs, which radiate from the centre and whose extremities correspond with those of the ribs on the outer surface of the compartments. Like those of the compartments, they are much more prominent on the one side of the basis than on the other. The interior surface of the shell and the basis have not been investigated.

The scutum (Pl. XXVII, fig. 11, *a* and *c*) is nearly rectangular; it has the growth-ridges prominent and lightly crenulated, especially in the basal part of the valve; the surface of the part near the apex is almost perfectly smooth. The tergal margin is straight; a small part of the outer surface along that margin is reflexed and this reflexed part on the right side-scutum extends farther towards the basal margin than on the scutum of the other side. It terminates in the right side-scutum in a distinct tooth at the basi-tergal angle. The inner surface shows a very prominent articular ridge and a hardly less prominent adductor ridge, extending high up towards the apex. The cavity for the lateral depressor muscle is distinct, even rather strongly developed.

The tergum (Pl. XXVII, fig. 11*b*) is thin and very brittle; its beak is not produced, its scutal margin nearly straight, its spur is about half the width of the valve. The basal end of the spur is rounded off, the basal margin of the tergum slightly hollowed out. The whole valve is about two-thirds of the width of the scutum, this valve like the scutum resembling in many respects the corresponding parts of DARWIN's var. (1).

DARWIN did not give a description of the mouth and cirri of this genus. He pointed out in the description of the genus only that in the characters derived from these parts there are no generic differences between the genera *Pyrgoma* and *Creusia*. I think it of some importance to give here a short description of these parts in the present variety, so far as I have been able to study them.

Mouth. Labrum (Pl. XXVII, fig. 12). Lateral margins on both sides of notch make an angle; notch rather wide at entrance and not very deep. There are found 3 to 4 teeth on either side of the notch, one of these on either side being much smaller. No hairs are observable on the margins of the notch or along the edge of the labrum.

Palpi oval, the upper and lower margins nearly parallel, the free extremity broadly rounded off. Delicate hairs are disposed along the lower margin; the stronger hairs along the upper margin are developed only on the distal part of that margin. The outer surface is furnished with a group of longer spines or spine-like hairs, which also occupy only the distal extremity and which meet downwards with a double row of such spines, making an angle with the lower margin. The inner surface is covered with numerous shorter and curled hairs, part of which fall over the free edge of the labrum so long as the palpus is not lifted up.

Mandible (Pl. XXVII, fig. 13). Distance between extremities of teeth 1 and 2 greater than that between teeth 2 and 3. One and two of about the same size, 3 somewhat shorter; 2 and 3 are indistinctly double at the extremity. Tooth 4 represented by a blunt triangular knob, larger at the mandible of the one side than at the other. Tooth 5 and inferior angle form together a small truncated projection. Row of hairs along inferior margin rather elongate.

Maxilla (Pl. XXVII, fig. 14). Edge straight, making a rectangle with the inferior margin. Spines of the upper and lower pairs of about the same size. Between these two pairs, five intermediate ones are disposed, the 2nd and 4th of which are slightly longer than the other three. There is no notch behind the upper pair, but all the spines are disposed at small distances from each other. Among the spines numerous long hairs are inserted. Apodeme ong and slender.

Outer maxillae (Pl. XXVII, fig. 15). Outer lobe broken off, lost; inner lobe somewhat elongate, covered over inner surface with several rows of partly feathered hairs. These stand off horizontally or are directed towards the basal part of the maxilla.

Cirri. Cirri 1 to 3 lost.

Cirrus 4 has slightly unequal rami of 13 to 14 and 14 to 15 segments. The middle segments are less than four times as long as broad, and bear 2 pairs of spines on their inner faces. On the outer side, each segment bears a few hairs at the extremity, one of which is rather long, nearly as long as the segment itself. No trace of teeth on inner face of lower segments.

Cirrus of 5th pair has unequal rami of 16 and 20 segments. The middle segments bear three pairs of spines on the inner face: a pair of very small ones disposed about the middle of the anterior margin, a pair of long ones near the extremity, and a pair of small ones half way between both pairs. Hairs on outer face near extremity of segments rather long.

Cirrus of 6th pair (Pl. XXVII, fig. 16). Rami not very unequal, of 20 and 22 segments. Greatest number of spines on the inner face of the middle segments 3 pairs — as on the segments of the 5th cirrus. Spine-like hairs disposed at the extremity of the segments on outer face nearly as long as the segments themselves.

Penis long, growing narrower towards the extremity. Very few hairs only are seen scattered over surface, hardly any hairs at the extremity.

The only specimen of this species that the Siboga collected was dredged at:

Stat. 313. February 14/16, 1900. Anchorage East of Dangar Besar, Saleh- (or Sapeh-)bay. Depth up to 36 m. Bottom: sand, coral, and mud.

Genus **Chthamalus** Ranzani

Darwin described eight species of *Chthamalus* in his Monograph (1854). The "Challenger" collected a Cirripede belonging to this genus which I introduced into science as a ninth species. So far as I know, no other forms or species of this genus have been collected, nor has our knowledge of the habits, distribution etc. of the known species greatly increased since Darwin published his Monograph.

Only two of these species have been observed in the Malay Archipelago (*Ch. stellatus* Poli and *Ch. intertextus* Darwin); two other forms, however, were collected in "adjacent" waters: *Ch. antennatus* Darwin at New South Wales and van Diemensland and *Ch. challengeri* Hoek taken from the screw of the frigate, after having remained for some time in the waters of Japan. (Gruvel[1] says that *Ch. antennatus* occurs also in Chili, but he does not mention the author who observed it there.)

Ch. stellatus is the only species that is widely distributed: it lives on the coast-rocks of Southern Europe, of the Southern United States, also at Woodshole (Sumner), on the coasts of Brazil, of the Red Sea, coast of Bengal, the Philippine Archipelago, coast of China, of California etc. So far as our knowledge goes, all the other species — with the exception of the somewhat problematic case of *Ch. antennatus* mentioned above — have only a much more limited or even local distribution. Yet *Ch. stellatus* was not observed attached to floating objects, as was the case with *Ch. dentatus* and *Ch. challengeri* which were taken from ships' bottoms. Like most of the other species, *Ch. stellatus* lives attached to littoral rocks, none of the species having been observed at any important depth.

H. M. S. "Siboga" brought home specimens of two species belonging to this genus.

1. *Chthamalus stellatus* Poli. Pl. XXVII, fig. 17—22.

Darwin, Ch., Monograph. The Balanidae, Verrucidae etc. 1854. p. 455, pl. XVIII, fig. 1*a*—1*h*.

[1] Gruvel, A., Monographie des Cirrhipèdes. 1905. p. 203.

Half-a-dozen small specimens, attached to a piece of blackish stone, were collected in the Bay of Pidjot, Eastcoast of Lombok, when H. M. S. "Siboga" paid a visit to that island. The specimens were in dry condition when I investigated them; their peculiar appearance may be partly due to this circumstance.

The shell was much depressed, the walls folded, sutures partly obliterated, orifice broadly oval (Pl. XXVII, fig. 17).

The scutum (fig. 18, *a*) has the tergal margin much shorter than the other margins and deeply notched in the lower half near the basi-tergal angle. Occludent and carinal margins are both furnished with rather strong rims, the whole valve being unusually thick.

The latter is the case in a still higher degree with the tergum (fig. 18). Its scutal margin is deeply notched for the reception of the broad process of the tergal margin of the scutum, and has a strong nearly quadrangular tooth fitting in the deep notch of the tergal margin of the scutum. Its apex is rounded, its carinal margin curved, the crests for the depressor muscle very strongly developed, its basal margin nearly straight and terminating in a small triangular process, which seems to represent the spur. The shape of the tergum somewhat resembles that of var. *communis* Darwin; but the scutum is quite different, being nearly equilateral in var. *communis*, and having the tergal margin relatively short in the present form.

The structure of the mouth and of the cirri corresponds with Darwin's description. As no figures of these parts of a species of *Chthamalus* have been published before, I think it not superfluous to give a few figures for the present form.

The crest of the labrum (Pl. XXVII, fig. 19) is not only hairy, but furnished with a row of teeth as well. The palpi are quadrate, with rounded edges, and are furnished with numerous and partly very long hairs.

The mandible (Pl. XXVII, fig. 20) has three main teeth, the fourth is very small, laterally double and confluent with the lower pectinated angle.

The maxilla (Pl. XXVII, fig. 21) has two larger spines above the notch and a few very delicate spines between these two larger ones and in the notch. The spines disposed along the outer edge are not very strong, those at the lower angle very delicate.

The outer maxillae have the outer margin rounded and the inner margin sinuous. A strong tuft of bristles is disposed at the tip and along the outer side of this maxilla. The part representing the inner lobe is not prominent.

Cirri. The first pair are situated close to the mouth; its branches are relatively short, with broad segments. The shorter and broader branch has five, the other, which is slightly more elongate and less broad, has six not very distinct segments. All the segments of both branches are furnished with numerous hairs, which form a continuous row along the outer margin of the shorter branch and dense groups on the surface of the segments. The lower segments of the longer ramus bear 3 to 4 short strong spines of conical shape which are about three times as long as broad at their basis and which are disposed on the side directed towards the shorter branch.

The cirri of the second pair are slightly longer than those of the first pair. Each ramus has 6 segments and is thickly clothed with spines. The outer segments of both branches bear

a dense tuft of pectinated spines (Pl. XXVII, fig. 22) which DARWIN sometimes observed in this species also and which according to him occur in specimens from La Plata. The outer surface of the pedicel of this cirrus bears the tuft of long spines as described by DARWIN.

The cirrus of the third pair has rami of nearly equal length, both composed of 14 segments. The number of pairs of spines on the inner side of the segments is four, the length of the spines greatly diminishing from the upper to the lower pair. The third pair of cirri have exactly the same structure as the fourth, the latter, however, are slightly longer and have 16 segments in each ramus in the specimen which was examined. The sixth pair has 18 segments in both rami.

The penis is very long, more than twice as long as the cirri of the last pair. It is distinctly ringed, broad at the basis and much narrower towards the extremity. A few delicate hairs are scattered over its surface, the last segment bearing a tuft of such hairs disposed on both sides of a somewhat elongate slit-like opening.

To this species, most probably, belong also a few small specimens of a *Chthamalus* attached to a piece of rock or stone, found on the reef at Sapek-Bay, East-coast of Sumbawa. They are very small specimens and they are slightly different from each other. The largest has a diameter at the basis of about 5 mm., the smaller ones of 2.5 and 3 mm. respectively. Whilst the smaller ones have the orifice of an elongate shape, that of the larger specimen is about as long as broad. Of the latter specimen the opercular valves were examined. Its scutum is triangular, with the basal and opercular margins long, the tergal margin relatively short. It is feebly folded in the direction from the apex to the middle of the basal margin, the latter being distinctly hollowed out about the middle. The tergum is small; it has a very prominent articular ridge, the part corresponding with the spur of other species rather broad and rounded at the extremity; it has the opercular margin short and distinctly arched, and it is furnished with very prominent crests for the adductor muscle, the extremities of which reach distinctly beyond the basal margin. The colour of the smaller specimens is dirty olive-greenish, that of the larger one blackish-blue. The basis of the larger specimen is on one side, and partly overgrown by the shell of a Lamellibranchiate Mollusc — a circumstance that does not make it easier to give a good description. The alae of the rostrum are well-developed, broad at the upper extremity and terminating downwards into a point; the radii of the rostro-lateral compartments are indistinct, but certainly very narrow. The little stone with these small Barnacles was collected on the reef along the coast of Sumbawa during shore-exploration, and was found, probably, at a very inconsiderable depth.

2. *Chthamalus intertextus* Darwin.

DARWIN, CH., Monograph. The Balanidae, Verrucidae etc. 1854. p. 467, pl. XIX, fig. 1*a*, 1*b*.

At Station 16 a single specimen was collected, in very defective condition, and I think that it belongs to this species. The oblique interfolding laminae of the parietes, the

shape of the scutum and tergum, the strongly marked crests for the depressor muscles, extending beneath the basal margin of the tergum, are so characteristic that I could have no doubt as to its specific nature.

Yet, in some respects the "Siboga" specimen differs from DARWIN's description. The scutum and tergum were so intimately joined together that only a trace of a suture could be seen externally. By boiling these valves with caustic potash I easily separated them from each other, but I think this would not have been the case if they were "completely calcified together" as DARWIN says they are. The inner basal edges of the parietes, moreover, were not inflected inwards, as DARWIN says is the case in all full-grown specimens. So far as can be made out with the incomplete object at my disposal, it is probably full-grown, measuring 11 mm. (the largest diameter of the basis), whilst the largest specimen that DARWIN saw was 0.35 of an inch (about 8 mm.) in basal diameter.

The only specimen collected by the "Siboga" was taken at:

Stat. 16. March 15/16, 1899. Lat. 6° 59′ S., Long. 115° 24′.7 E. [Bay of Kankamaraän, S. coast of Kangeang.] Depth 22 m. Bottom: mud.

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Note. The name *Scalpellum ventricosum* used in this Index and in the Introduction to the Report is to take the place of *Scalpellum arcuatum*, used p. 98, as the latter was preoccupied by DARWIN for a fossil species (Pal. Soc. Mon. Foss. Lepadidae. 1851. p. 40).

PLATE XI

Fig. 1—6. *Verruca cassis* n. sp.

Fig. 1. Moveable scutum; magnified 16 diameters.
Fig. 2. Moveable tergum; magnified 16 diameters.
Fig. 3. Rostrum; magnified 16 diameters.
Fig. 4. Carina, external view; magnified 16 diameters.
Fig. 4*a*. Carina, internal view; magnified 16 diameters.
Fig. 5. Fixed tergum; magnified 16 diameters.
Fig. 6. Fixed scutum; magnified 16 diameters.

Fig. 7—13. *Verruca grex* n. sp.

Fig. 7. Group of specimens; magnified 3 diameters.
Fig. 8. Specimen, seen from the side of the moveable valves; magnified 7,6 diameters.
Fig. 9. Specimen, seen from the side of the fixed valves; magnified 7,6 diameters.
Fig. 10. Moveable scutum; magnified 16 diameters.
Fig. 11. Moveable tergum; magnified 16 diameters.
Fig. 12. Fixed scutum; magnified 16 diameters.
Fig. 13. Fixed tergum; magnified 16 diameters.

Fig. 14—15. *Verruca conchula* n. sp.

Fig. 14. Specimen, seen from the side of the moveable valves; magnified 11 diameters.
Fig. 15. Specimen, seen from the side of the fixed valves; magnified 11 diameters. *m*. part of membranous basis; *b*. part of the outer surface of the object to which the shell was attached; *o*. part of the ovary.

Fig. 16—17. *Verruca conchula* var. *minor* n. var.

Fig. 16. Shell, seen from the side of the moveable valves; magnified 10 diameters.
Fig. 17. Shell, seen from the side of the fixed valves; magnified 10 diameters.

P. P. C. Hoek del.

VERRUCA.

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PLATE XII

Fig. 1—3. *Verruca capsula* n. sp.

Fig. 1. Shell, seen from the side of the moveable valves; magnified 5 diameters.

Fig. 2. Shell, seen from above; magnified 4 diameters.

Fig. 3. Moveable scutum (left-hand figure), and moveable tergum (right-hand figure), internal view; magnified 8 diameters.

Fig. 4—6. *Verruca navicula* n. sp.

Fig. 4. Shell, seen from the side of the moveable valves; magnified 7 diameters.

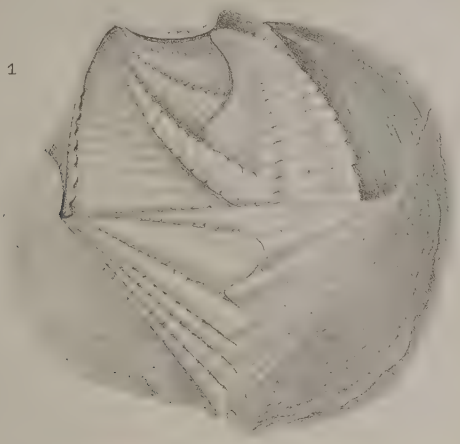
Fig. 5. Shell, seen from the side of the fixed valves; magnified 7 diameters.

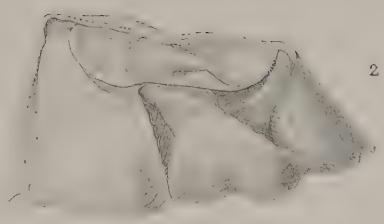
Fig. 6. Shell of younger specimen, seen from the side of the moveable valves; magnified 30 diameters.

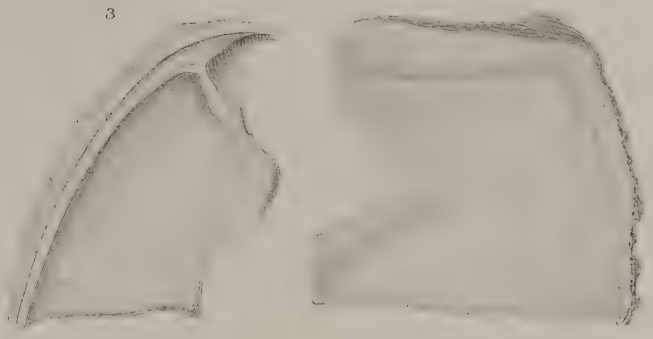
Fig. 7—8. *Verruca cassis* n. sp.

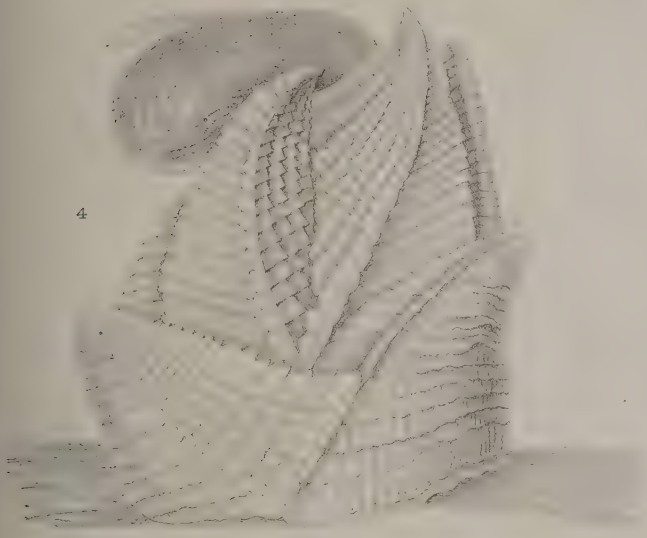
Fig. 7. Shell, seen from the side of the moveable valves; magnified 8,5 diameters.

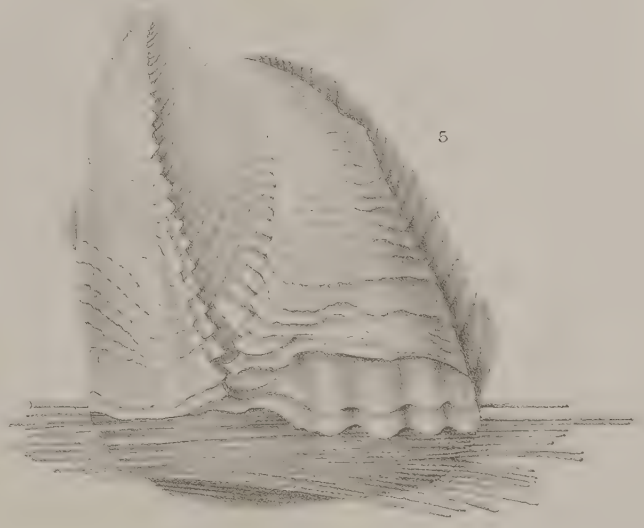
Fig. 8. Shell, seen from the side of the fixed valves; magnified 8,5 diameters.











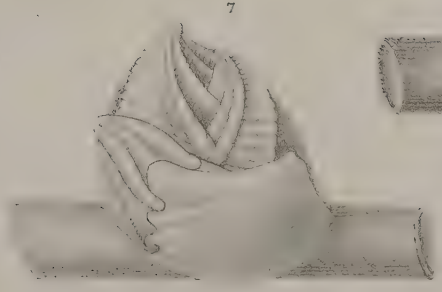


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PLATE XIII

Fig. 1—4. *Verruca capsula* n. sp.
- Fig. 1. Mandible; magnified 52,5 diameters.
- Fig. 2. Maxilla; magnified 52,5 diameters.
- Fig. 3. Outer maxilla; magnified 52,5 diameters.
- Fig. 4. Caudal appendage, last segments; magnified 180 diameters.

Fig. 5—7. *Verruca navicula* n. sp.
- Fig. 5. Mandible; magnified 180 diameters.
- Fig. 6. Maxilla; magnified 180 diameters.
- Fig. 7. Caudal appendage, last segments; magnified 180 diameters.

Fig. 8—10. *Verruca cassis* n. sp.
- Fig. 8. Mandible; magnified 180 diameters.
- Fig. 9. Maxilla; magnified 180 diameters.
- Fig. 10. Caudal appendage, last segments; magnified 180 diameters.

Fig. 11—13. *Verruca grex* n. sp.
- Fig. 11. Mandible; magnified 180 diameters.
- Fig. 12. Maxilla; magnified 180 diameters.
- Fig. 13. Caudal appendage, last segments; magnified 180 diameters.

Fig. 14—15. *Verruca casula* n. sp.
- Fig. 14. Animal seen from the side of the moveable valves; magnified 14 diameters.
- Fig. 15. Animal seen from the side of the fixed valves; magnified 14 diameters.

Fig. 16—19. *Balanus tintinnabulum* (Linn.) var. *validus* Darwin.
- Fig. 16. Labrum with left-hand palpus, internal view; magnified 30 diameters.
- Fig. 16*a*. Right-hand palpus, external view; magnified 30 diameters.
- Fig. 17. Mandible; magnified 30 diameters.
- Fig. 18. Maxilla; magnified 30 diameters.
- Fig. 19. Outer maxillae; magnified 30 diameters.

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PLATE XIV

Fig. 1—4. *Balanus tintinnabulum* (Linn.) var. *validus* Darwin.

Fig. 1. Cirrus of first pair; magnified 14 diameters.

Fig. 2. Cirrus of second pair; magnified 14 diameters.

Fig. 3. Cirrus of third pair. *a*. Membranous plate fringed with fine bristles; magnified 14 diameters.

Fig. 4. Segments 12 and 13 of the cirrus of the sixth pair; magnified 30 diameters.

Fig. 5—6. *Balanus tintinnabulum* (Linn.) var. *costatus* n. var.

Fig. 5. Animal seen from above; magnified 4,1 diameters.

Fig. 6. *a*. tergum, internal view; magnified 8 diameters.
b. scutum, internal view; magnified 8 diameters.
c. scutum, external view; magnified 8 diameters.
d. tergum, external view; magnified 8 diameters.

Fig. 7. *Balanus tintinnabulum* (Linn.) var. *plicatus* n. var.

Fig. 7. Animal seen from above, with smaller specimen attached to it; magnified 4,1 diameters.

Fig. 8—17. *Balanus amphitrite* Darwin.

Fig. 8—11, 12*, 13, 14, 15, and 17: var. *malayensis* n. var.

Fig. 8. Animal, lateral view; magnified 4 diameters.

Fig. 9. Same specimen, seen from below; magnified 4 diameters.

Fig. 10. *a*. scutum, internal view; magnified 10 diameters.
b. tergum, internal view; magnified 10 diameters.
c. scutum, external view; magnified 10 diameters.
d. tergum, external view; magnified 10 diameters.

Fig. 11. Transverse sections of lateral compartment; magnified 20 diameters.
a. about the middle of the height.
b. near the upper extremity.

Fig. 12*. Right-hand palpus, external view; magnified 64 diameters.

Fig. 13. Mandible; magnified 64 diameters.

Fig. 14. Maxilla, with 7 spines between upper and lower pair; magnified 64 diameters.

Fig. 15. Outer maxillae; magnified 44,5 diameters.

Fig. 17. Inner face of middle segment of cirrus of 6th pair; magnified 206,5 diameters.

Fig. 12, 14*, and 16: var. *communis* Darwin.

Fig. 12. Labrum, external view; magnified 140 diameters.

Fig. 14*. Maxilla, with 5 spines between upper and lower pair; magnified 140 diameters.

Fig. 16. Inner face of 4th and 5th segments of cirrus of third pair; magnified 206,5 diameters.

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PLATE XV

Fig. 1—8. *Balanus alatus* n. sp.

Fig. 1. Animal, lateral view; magnified 10,5 diameters.

Fig. 2. *a* and *b*, tergum and scutum, united, external view; magnified 13 diameters.
c, tergum and *d*, scutum, internal view; magnified 13 diameters.

Fig. 3. Transverse section of carina; magnified 44,5 diameters.

Fig. 4. Labrum, with right-hand palpus, external view; magnified 42 diameters.

Fig. 4*. Left-hand palpus, external view; magnified 144 diameters.

Fig. 5. Mandible; magnified 144 diameters.

Fig. 6 and 6*, Right- and left-hand maxilla; magnified 144 diameters.

Fig. 7. Fifth segment of longer ramus of third cirrus; magnified 206,5 diameters.

Fig. 8. Middle segment of sixth cirrus; magnified 206,5 diameters.

Fig. 9—16. *Balanus minutus* n. sp.

Fig. 9. Animal, lateral view; magnified 7 diameters.

Fig. 10. *a*. scutum internal view; magnified 14,5 diameters.
b. scutum external view; magnified 14,5 diameters.
c. tergum external view; magnified 14,5 diameters.

Fig. 11. Labrum with right-hand palpus, external view; magnified 64 diameters.

Fig. 12. Mandible; magnified 64 diameters.

Fig. 13. Maxilla; magnified 206,5 diameters.

Fig. 14. Outer maxillae, outer lobe; magnified 64 diameters.

Fig. 15. Third cirrus, fourth segment; magnified 206,5 diameters.

Fig. 16. Sixth cirrus, middle segment; magnified 64 diameters.

Fig. 17—21. *Balanus amaryllis* Darw.

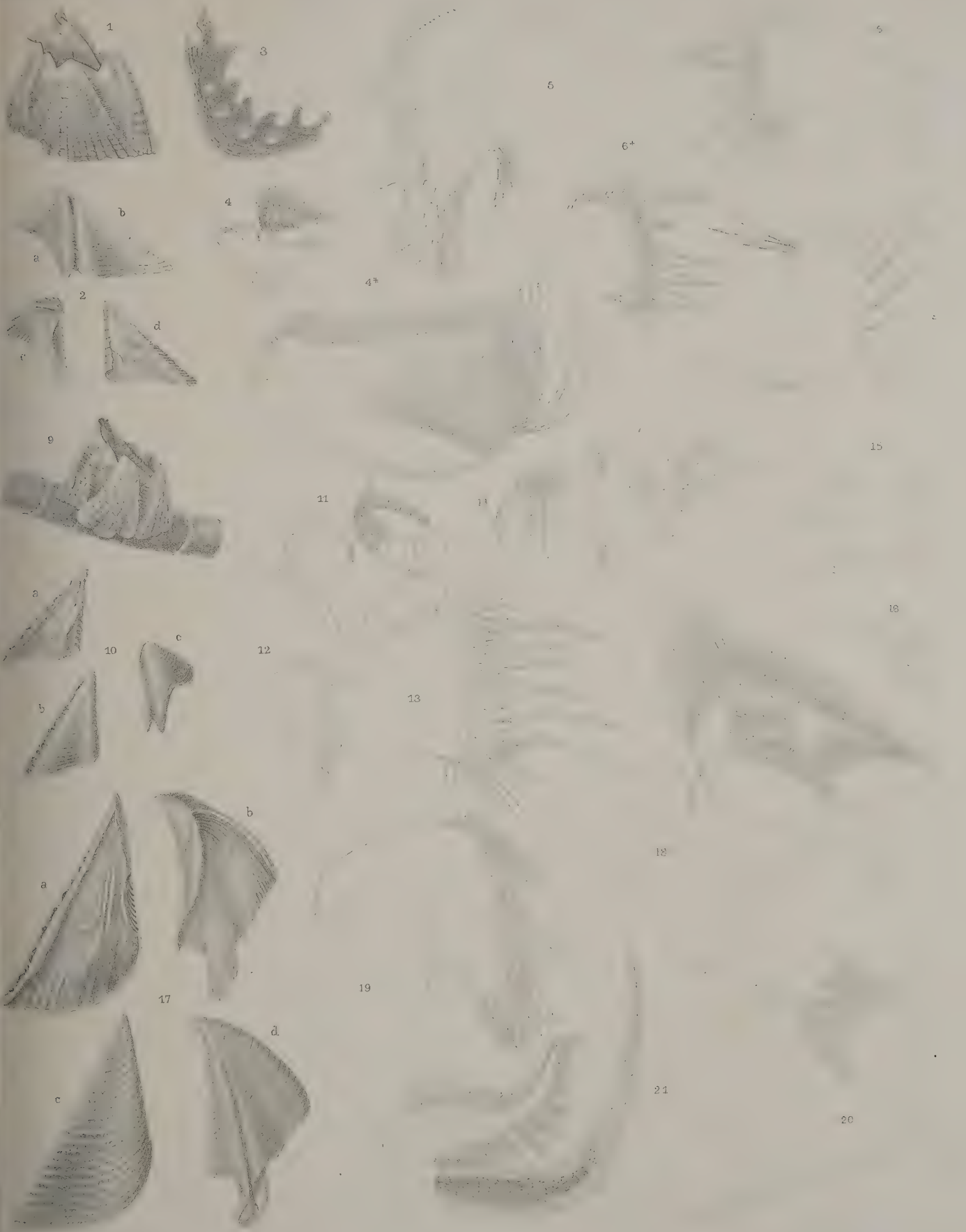
Fig. 17. *a*, scutum, *b*, tergum, internal view; magnified 5 diameters.
c, scutum, *d*, tergum, external view; magnified 5 diameters.

Fig. 18. Labrum, with right-hand palpus, external view; magnified 30 diameters.

Fig. 19. Mandible; magnified 30 diameters.

Fig. 20. Maxilla; magnified 30 diameters.

Fig. 21. First cirrus; magnified 14 centimeters.



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BALANUS.

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PLATE XVI

Fig. 1—4. *Balanus amaryllis* Darwin.

Fig. 1. Outer maxillae; magnified 30 diameters.
Fig. 2. Cirrus of second pair; magnified 14 diameters.
Fig. 3. Cirrus of third pair; magnified 14 diameters.
Fig. 4. Cirrus of sixth pair, two segments about the middle of the cirrus; magnified 44,5 diameters.

Fig. 5—11. *Balanus bimae* n. sp.

Fig. 5. Animal, lateral view; magnified 4 diameters.
Fig. 6. *a* and *b*, scutum and tergum, internal view; magnified 8 diameters.
c and *d*, scutum and tergum, external view; magnified 8 diameters.
Fig. 7. Labrum with palpi; magnified 44,5 diameters.
Fig. 8. Mandible; magnified 44,5 diameters.
Fig. 9. Maxilla; magnified 44,5 diameters.
Fig. 9*. Maxilla, edge with spines; magnified 144 diameters.
Fig. 10. Outer maxillae; magnified 44,5 diameters.
Fig. 11. Cirrus of sixth pair, two of the middle segments; magnified 64 diameters.

Fig. 12—13. *Balanus albus* n. sp.

Fig. 12. Animal, lateral view; magnified 3,2 diameters.
Fig. 13. *a* and *b*, scutum and tergum, internal view; magnified 4,6 diameters.
c and *d*, scutum and tergum, external view; magnified 4,2 diameters.

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Fa. P. W. M. Trap, impr.

PLATE XVII

Fig. 1—6. *Balanus albus* n. sp.

Fig. 1. Labrum and right-hand palpus; magnified 30 diameters.
Fig. 2. Mandible; magnified 30 diameters.
Fig. 3. Maxilla; magnified 30 diameters.
Fig. 3*. Edge of maxilla with spines; magnified 64 diameters.
Fig. 4. Outer maxillae; magnified 30 diameters.
Fig. 5. Cirrus of 6th pair, 26th and 27th segments; magnified 44,5 diameters.
Fig. 6. Smaller specimen, lateral view; magnified 4,5 diameters.

Fig. 7—13. *Balanus maculatus* n. sp.

Fig. 7. Animal, lateral view; magnified 3 diameters.
Fig. 8. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, lateral view; magnified 10 diameters.
Fig. 9. Labrum, with right-hand palpus; magnified 44,5 diameters.
Fig. 10. Mandible; magnified 44,5 diameters.
Fig. 11. Maxilla; magnified 44,5 diameters.
Fig. 11*. Edge of maxilla with spines; magnified 64 diameters.
Fig. 12. Outer maxillae; magnified 44,5 diameters.
Fig. 13. Cirrus of 6th pair, one of the middle segments; magnified 64 diameters.

Fig. 14—19. *Balanus tenuis* Hoek.

Fig. 14. Animal, attached to part of shell of larger specimen; magnified 3,2 diameters.
Fig. 15. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 16. Labrum, with right-hand palpus; magnified 64 diameters.
Fig. 17. Mandible; magnified 64 diameters.
Fig. 18. Maxilla; magnified 64 diameters.
Fig. 18*. Edge of maxilla, with spines; magnified 206,5 diameters.
Fig. 19. Cirrus of 6th pair, one of the middle segments; magnified 64 diameters.

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BALANUS.

Fa. P. W. M. Trap impr.

PLATE XVIII

Fig. 1. *Balanus tenuis* Hoek.

Fig. 1. Outer maxillae; magnified 64 diameters.

Fig. 2—12. *Balanus socialis* Hoek.

Fig. 2. Two specimens attached to a piece of shell; magnified 10 diameters.

Fig. 3. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.

Fig. 4. *a* and *b*, two sections through the walls: *a*, near the orifice and *b*, near the basis; magnified 15 diameters.

Fig. 5. Labrum, with right-hand palpus; magnified 64 diameters.

Fig. 6. Mandible; magnified 64 diameters.

Fig. 7. Maxilla; magnified 64 diameters.

Fig. 7*. Edge of maxilla with spines; magnified 206,5 diameters.

Fig. 8. Outer maxillae; magnified 64 diameters.

Fig. 9. Sixth cirrus, two of the middle segments; magnified 64 diameters.

Fig. 10. Specimen with swollen compartments and elongated carina; magnified 10 diameters.

Fig. 11. Specimen with very broad alae; magnified 10 diameters.

Fig. 12. Tergum of the specimen with very broad alae: *a*, internal, *b*, external view; magnified 10 diameters.

Fig. 13—19. *Balanus maldivensis* Borradaile.

Fig. 13. Specimen attached to the spine of an Echinid; magnified 10 diameters.

Fig. 14. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.

Fig. 15. Labrum, with left-hand palpus; magnified 144 diameters.

Fig. 16. Mandible; magnified 144 diameters.

Fig. 17. Maxilla; magnified 144 diameters.

Fig. 18. Outer maxillae; magnified 64 diameters.

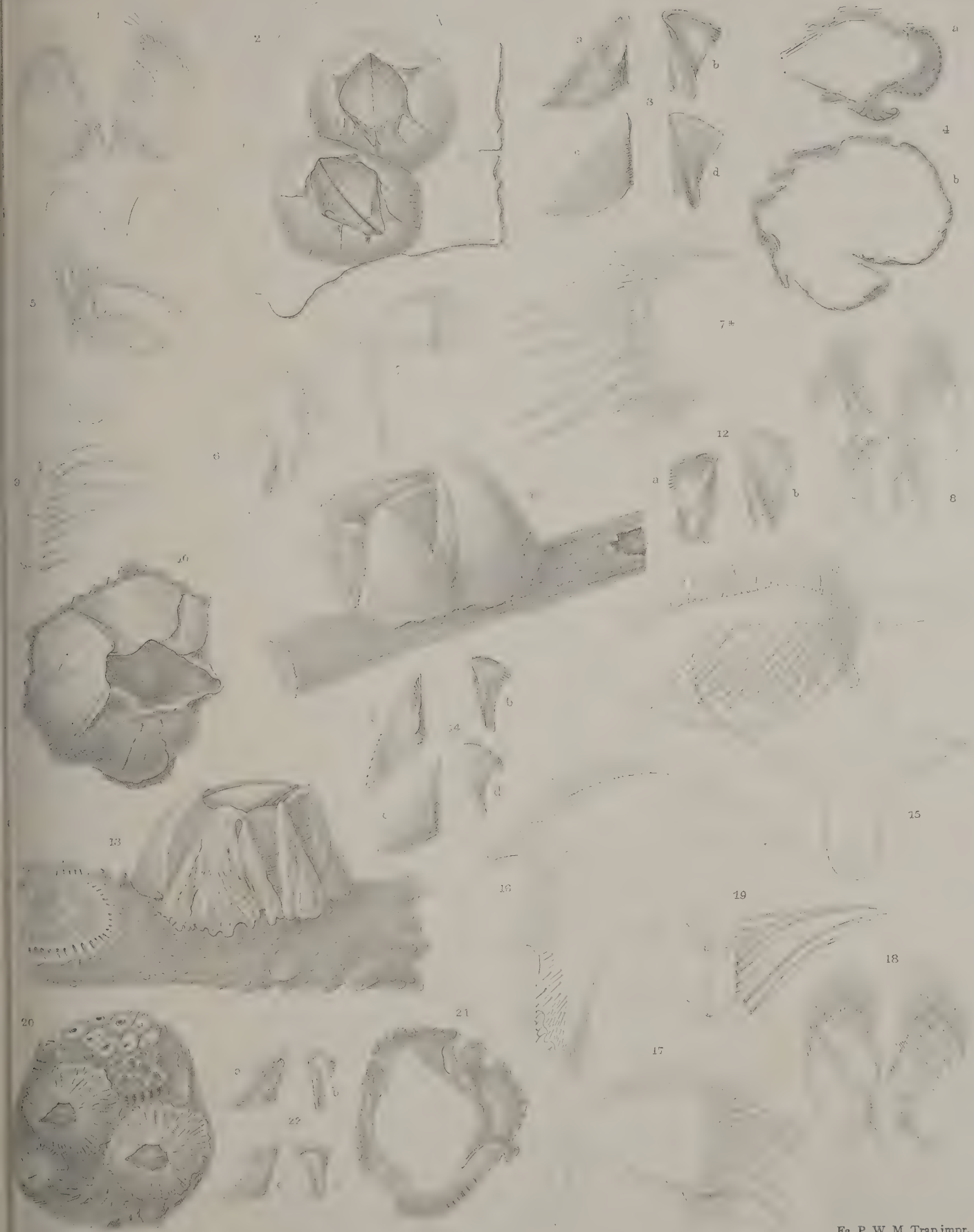
Fig. 19. Sixth cirrus, last segment but 7^{th}; magnified 64 diameters.

Fig. 20—22. *Balanus auricoma* n. sp.

Fig. 20. Group of specimens attached to a stone; magnified 10 diameters.

Fig. 21. Horizontal section through the valve near the basis; magnified 14 diameters.

Fig. 22. *a* and *b*, scutum and tergum, internal view; magnified 8,2 diameters.
c and *d*, scutum and tergum, external view; magnified 8,2 diameters.



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BALANUS.

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PLATE XIX

Fig. 1—7. *Balanus auricoma* n. sp.

Fig. 1. *a*, scutum, *b*, tergum, internal view; magnified 44,5 diameters.
Fig. 2. Labrum; magnified 64 diameters.
Fig. 3. Mandible; magnified 64 diameters.
Fig. 4. Maxilla; magnified 64 diameters.
Fig. 4*. Edge of maxilla with spines; magnified 206,5 diameters.
Fig. 5. Outer maxillae; magnified 64 diameters.
Fig. 6. Sixth cirrus, one of the middle segments; magnified 206,5 diameters.
Fig. 7. Small specimen, from Station 260; magnified 8,5 diameters.

Fig. 8—16. *Balanus ciliatus* n. sp.

Fig. 8. Group of specimens; magnified 6 diameters.
Fig. 9. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 10. Labrum, with left-hand palpus; magnified 44,5 diameters.
Fig. 11. Mandible; magnified 45,5 diameters.
Fig. 12. Maxilla; magnified 44,5 diameters.
Fig. 12*. Edge of maxilla, with spines; magnified 144 diameters.
Fig. 13. Outer maxillae; magnified 44,5 diameters.
Fig. 14. Third cirrus, longer ramus, 5th segment; magnified 144 diameters.
Fig. 15. Fourth cirrus, 5th segment; magnified 144 diameters.
Fig. 16. Sixth cirrus, 12th segment; magnified 144 diameters.

Fig. 17. *Balanus compressus* n. sp.

Fig. 17. Specimen attached to the tube of an Annelid; magnified 4 diameters.

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BALANUS.

Fa. P. W. M. Trap impr.

PLATE XX

Fig. 1—7. *Balanus compressus* n. sp.

Fig. 1. *a* and *b*, scutum and tergum, internal view; magnified 8 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 2. Labrum; magnified 64 diameters.
Fig. 3. Mandible; magnified 144 diameters.
Fig. 3*. Edge of mandible of the other side; magnified 144 diameters.
Fig. 4. Edge of maxilla, with spines; magnified 206,5 diameters.
Fig. 5. Maxillae; magnified 44,5 diameters.
Fig. 6. Third cirrus, 5th segment; magnified 144 diameters.
Fig. 7. Sixth cirrus, one of the middle segments; magnified 44,5 diameters.

Fig. 8—16. *Balanus longirostrum* n. sp.

Fig. 8. Animal, lateral view; magnified 10 diameters.
Fig. 9. Rostrum, external view; magnified 10 diameters.
Fig. 10. *a* and *b*, scutum and tergum, internal view; magnified 13 diameters.
c and *d*, scutum and tergum, external view; magnified 13 diameters.
Fig. 11. Labrum, with right-hand palpus; magnified 64 diameters.
Fig. 12. Mandible; magnified 64 diameters.
Fig. 13. Maxilla; magnified 64 diameters.
Fig. 13*. Maxilla, edge with spines; magnified 206,5 diameters.
Fig. 14. Outer maxillae; magnified 64 diameters.
Fig. 15. Fourth cirrus, lower part; magnified 64 diameters.
Fig. 15*. Same cirrus, segments of pedicel and 3 segments of cirrus; magnified 144 diameters.
Fig. 16. Sixth cirrus, 16th segment; magnified 64 diameters.

Fig. 17—21. *Balanus terebratus* Darwin.

Fig. 17. Group of specimens; magnified 10 diameters.
Fig. 18. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 18*. Tergum, internal view; magnified 30 diameters.
Fig. 19. Mandible; magnified 144 diameters.
Fig. 20. Fourth cirrus, 4th segment; magnified 206,5 diameters.
Fig. 21. Sixth cirrus, one of the middle segments; magnified 144 diameters.

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PLATE XXI

Fig. 1—3. *Balanus terebratus* Darwin.

Fig. 1. Labrum, with left-hand palpus; magnified 144 diameters.
Fig. 2. Maxilla; magnified 144 diameters.
Fig. 3. Outer maxillae; magnified 144 diameters.

Fig. 4—14. *Balanus arcuatus* n. sp.

Fig. 4. Animal seen from above; magnified 10 diameters.
Fig. 5. Carino-lateral and lateral compartments, internal view; magnified 15 diameters.
Fig. 6. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 7. Transverse sections through compartments: *a*, not far from the orifice, *b*, halfway the height, *c*, near the basis; magnified 10 diameters.
Fig. 8. Labrum, with left-hand palpus; magnified 144 diameters.
Fig. 9. Mandible; magnified 64 diameters.
Fig. 10. Maxilla, outer part with spines; magnified 144 diameters.
Fig. 11. Outer maxillae, right-hand outer lobe; magnified 144 diameters.
Fig. 12. Third cirrus, fifth segment; magnified 206,5 diameters.
Fig. 13. Fourth cirrus, fourth segment; magnified 206,5 diameters.
Fig. 14. Sixth cirrus, tenth segment; magnified 206,5 diameters.

Fig. 15—20. *Balanus quadrivittatus* Darwin.

Fig. 15. Shell seen from above; magnified 7,6 diameters.
Fig. 16. *a* and *b*, scutum and tergum, internal view; magnified 7,6 diameters.
c and *d*, scutum and tergum, external view; magnified 7,6 diameters.
Fig. 17. Labrum; magnified 64 diameters.
Fig. 18. Mandible; magnified 64 diameters.
Fig. 19. Maxilla; magnified 64 diameters.
Fig. 19*. Maxilla, edge with spines; magnified 206,5 diameters.
Fig. 20. Outer maxillae; magnified 64 diameters.

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PLATE XXII

Fig. 1—2. *Balanus quadrivittatus* Darwin.

Fig. 1. Fourth cirrus, pedicel and lower segments; magnified 64 diameters.
Fig. 2. Sixth cirrus, one of the middle segments; magnified 64 diameters.

Fig. 3—10. *Balanus quinquevittatus* n. sp.

Fig. 3. Shell attached to shell of Gastropodous mollusc; magnified 4 diameters.
Fig. 4. *a* and *b*, scutum and tergum, internal view; magnified 7,6 diameters.
c and *d*, scutum and tergum, external view; magnified 7,6 diameters.
Fig. 5. Labrum, with left-hand palpus; magnified 64 diameters.
Fig. 6. Mandible; magnified 64 diameters.
Fig. 7. Maxilla; magnified 64 diameters.
Fig. 7*. Edge of maxilla, with spines; magnified 206,5 diameters.
Fig. 8. Outer maxillae; magnified 64 diameters.
Fig. 9. Fourth cirrus, pedicel and lower segments; magnified 144 diameters.
Fig. 10. Sixth cirrus, one of the middle segments; magnified 144 diameters.

Fig. 11—18. *Balanus hystrix* n. sp.

Fig. 11. Shell, side-view; magnified 7,5 diameters.
Fig. 12. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 13. Labrum, with left-hand palpus; magnified 144 diameters.
Fig. 14. Mandible; magnified 144 diameters.
Fig. 15. Maxilla, edge with spines; magnified 144 diameters.
Fig. 16. Third cirrus, 5th segment; magnified 206,5 diameters.
Fig. 17. Fifth cirrus, 5th segment; magnified 206,5 diameters.
Fig. 18. Sixth cirrus, 10th segment; magnified 206,5 diameters.

Fig. 19—25. *Balanus calceolus* Ellis.

Fig. 19. Shell, side-view; magnified 4,5 diameters.
Fig. 20. *a* and *b*, scutum and tergum, internal view.
c and *d*, scutum and tergum, external view.
Fig. 21. Labrum, with right-hand palpus; magnified 44,5 diameters.
Fig. 22. Mandible; magnified 44,5 diameters.
Fig. 23. Maxilla; magnified 44,5 diameters.
Fig. 23*. Edge of maxilla, with spines; magnified 144 diameters.
Fig. 24. Outer maxillae; magnified 44,5 diameters.
Fig. 25. Sixth cirrus, one of the middle segments; magnified 64 diameters.

Fig. 26. *Balanus navicula* Darwin.

Fig. 26. *a* and *b*, Shell, seen from right and left side; magnified 7,5 diameters.

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BALANUS.

PLATE XXIII

Fig. 1—3. *Balanus navicula* Darwin.

Fig. 1. *a* and *b*, scutum and tergum, internal view; magnified 42,5 diameters.
c and *d*, scutum and tergum, external view; magnified 42,5 diameters.

Fig. 2. Labrum, with right-hand palpus; magnified 144 diameters.

Fig. 3. Maxilla; magnified 144 diameters.

Fig. 4—11. *Balanus investitus* n. sp.

Fig. 4. Animal seen from above, attached to an *Acanthogorgia*, which also covers the *Balanus*; magnified 9 diameters.

Fig. 5. Shell, lateral view; magnified 9 diameters.

Fig. 6. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.

Fig. 7. Labrum, with right-hand palpus; magnified 144 diameters.

Fig. 8. Mandible; magnified 144 diameters.

Fig. 9. Maxilla; magnified 144 diameters.

Fig. 10. Outer maxillae; magnified 144 diameters.

Fig. 11. Sixth cirrus, one of the middle segments; magnified 64 diameters.

Fig. 12—16. *Balanus cornutus* n. sp.

Fig. 12. Shell seen from above; magnified 8 diameters.

Fig. 13. Shell, lateral view; magnified 8 diameters.

Fig. 14. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.

Fig. 15. Third cirrus, longer ramus, 4th segment; magnified 206,5 diameters.

Fig. 16. Sixth cirrus, eigth segment; magnified 64 diameters.

Fig. 17—21. *Balanus proripiens* n. sp.

Fig. 17. Animal, lateral view; magnified 4 diameters.

Fig. 18. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.

Fig. 19. Labrum, with right-hand palpus; magnified 64 diameters.

Fig. 20. Mandible; magnified 64 diameters.

Fig. 21. Maxilla; magnified 64 diameters.

Fig. 21^a. Edge of the maxilla, with spines; magnified 206,5 diameters.

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PLATE XXIV

Fig. 1—3. *Balanus proripiens* n. sp.

Fig. 1. Outer maxillae, with left-hand lobes; magnified 64 diameters.
Fig. 2. Third cirrus, longer ramus, last segments; magnified 144 diameters.
Fig. 3. Fourth cirrus, segments II—IV; magnified 206,5 diameters.

Fig. 4—10. *Balanus pentacrini* n. sp.

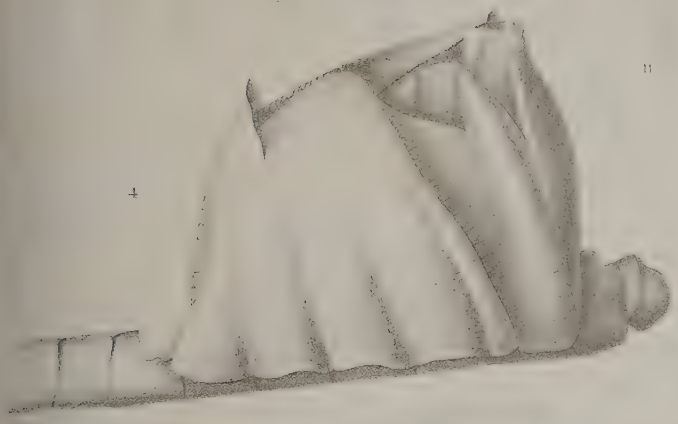
Fig. 4. Shell, lateral view; magnified 10 diameters.
Fig. 5. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 6. Labrum, with left-hand palpus; magnified 64 diameters.
Fig. 6*. Labrum of other specimen; magnified 144 diameters.
Fig. 7. Mandible; magnified 64 diameters.
Fig. 8. Maxilla; magnified 64 diameters.
Fig. 9. Outer maxillae; magnified 64 diameters.
Fig. 10. Sixth cirrus, 11th segment; magnified 64 diameters.

Fig. 11—16. *Acasta conica* n. sp.

Fig. 11. Shell, lateral view; magnified 10 diameters.
Fig. 12. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 13. Mandible; magnified 144 diameters.
Fig. 14. Outer maxillae; magnified 44.5 diameters.
Fig. 15. Third cirrus, lower segments; magnified 206,5 diameters.
Fig. 16. Fourth cirrus, pedicel and lower segments; magnified 144 diameters.

Fig. 17—19. *Acasta nitida* n. sp.

Fig. 17. Shell, larger specimen, lateral view; magnified 4 diameters.
Fig. 18. Shell, smaller specimen, front view; magnified 10 diameters.
Fig. 19. Mandible; magnified 44.5 diameters.



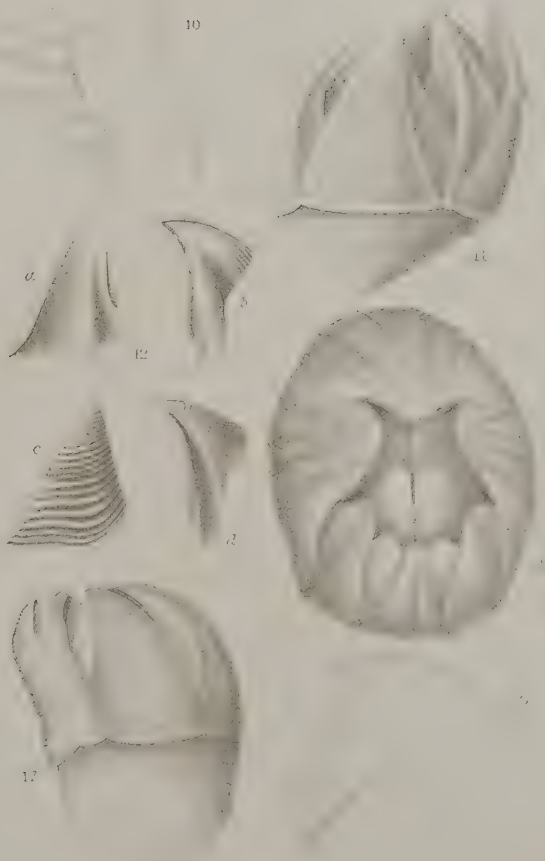


PLATE XXV

Fig. 1—3. *Acasta nitida* n. sp.

Fig. 1. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c and *d*, scutum and tergum, external view; magnified 10 diameters.
Fig. 2. Outer maxillae; magnified 44,5 diameters.
Fig. 3. Fourth cirrus, pedicel and lower segments; magnified 100 diameters.

Fig. 4—11. *Acasta glans* Lamarck.

Fig. 4. Shell, young specimen, lateral view; magnified 4 diameters.
Fig. 5. *a* and *b*, scutum and tergum of full-grown specimen, internal view; magnified 4 diameters.
Fig. 6. *a* and *b*, scutum and tergum of young specimen, external view; magnified 4 diameters.
Fig. 7. Labrum, with right-hand palpus; magnified 44,5 diameters.
Fig. 8. Mandible; magnified 44,5 diameters.
Fig. 9. Maxilla; magnified 44,5 diameters.
Fig. 10. Outer maxillae; magnified 44,5 diameters.
Fig. 11. Fourth cirrus, part of pedicel and lower segments; magnified 70 diameters.

Fig. 12—16. *Hexelasma arafurae* n. gen. n. sp.

Fig. 12. Shell, lateral view; magnified 3,25 diameters.
Fig. 13. *a* and *b*, scutum and tergum, internal view; magnified 3,6 diameters.
c and *d*, scutum and tergum, external view; magnified 5,2 diameters.
Fig. 14. Labrum with palpi, central part; magnified 44,5 diameters.
Fig. 15. *a*, right-hand-, *b*, left-hand-mandible; magnified 44,5 diameters.
Fig. 16. Maxilla; magnified 58 diameters.

P. P. C. Hoek del.

ACASTA—HEXELASMA.

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PLATE XXVI

Fig. 1—16. *Hexelasma velutinum* n. gen. n. sp.

Fig. 1. Shell, cylindrical form, lateral view; magnified 4 diameters.

Fig. 2. *a* and *b*, scutum and tergum, internal view; magnified 5,6 diameters.
c and *d*, scutum and tergum of the specimen of Fig. 1, external view; magnified 5,6 diameters.

Fig. 3. Shell, conical form, lateral view; magnified 4 diameters.

Fig. 4. Same specimen seen from above; magnified 4 diameters.

Fig. 5. *a* and *b*, scutum and tergum, internal view; magnified 5,6 diameters.
c and *d*, scutum and tergum of the specimen of fig. 3 and 4, external view; magnified 5,6 diameters.

Fig. 6. Rostrum, internal view; magnified 5,2 diameters.

Fig. 7. Labrum, central part, with right-hand palpus; magnified 144 diameters.

Fig. 8. Labrum with palpi; magnified 44,5 diameters.

Fig. 9. Triangular shield-formed central part of labrum; magnified 44,5 diameters.

Fig. 10. Part of border of labrum; magnified 206,5 diameters.

Fig. 11. Mandible; magnified 44,5 diameters.

Fig. 11*. Inferior angle of mandible of other specimen; magnified 206,5 diameters.

Fig. 12. Maxilla; magnified 44,5 diameters.

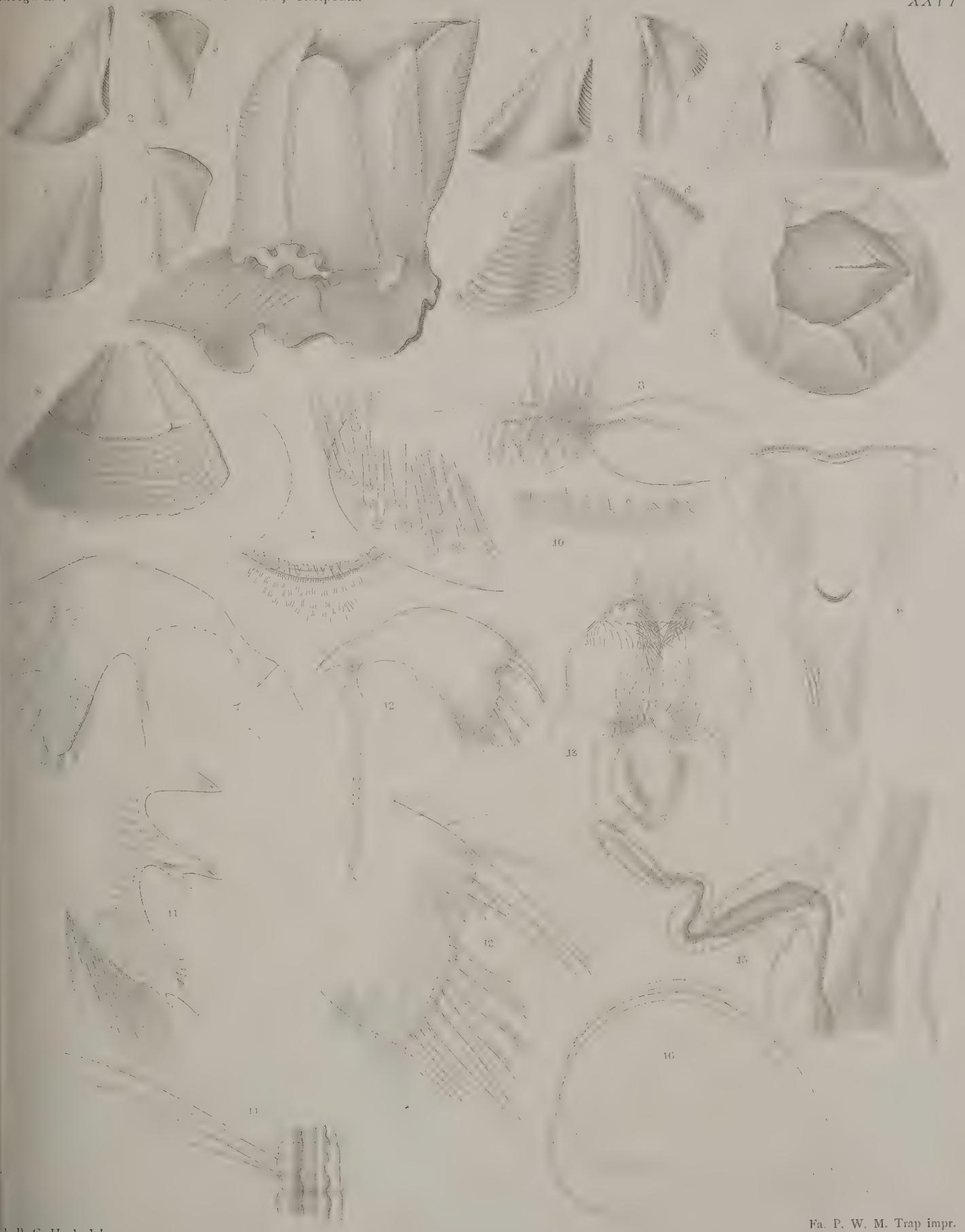
Fig. 12*. Edge of maxilla of other specimen; magnified 144 diameters.

Fig. 13. Outer maxillae; magnified 44,5 diameters.

Fig. 14. Sixth cirrus, one of the middle segments; magnified 44,5 diameters.

Fig. 15. Penis and lower segment of pedicel of sixth cirrus; magnified 44,5 diameters.

Fig. 16. Sixth cirrus and penis, to show the size of the latter; magnified 10 diameters.



P. P. C. Hoek del. HEXELASMA. Fa. P. W. M. Trap impr.

PLATE XXVII

Fig. 1—2. *Pyrgoma kuri* n. sp.

Fig. 1. Shells attached to the coral; magnified 4,75 diameters.

Fig. 2. *a* and *b*, scutum and tergum, internal view; magnified 16 diameters.
c and *d*, scutum and tergum, external view; magnified 16 diameters.

Fig. 3—8. *Pyrgoma jedani* n. sp.

Fig. 3. Colony of animals; magnified 2 diameters.

Fig. 4. *a* and *b*, scutum and tergum, internal view; magnified 13,5 diameters.
c and *d*, scutum and tergum, external view; magnified 13,5 diameters.

Fig. 5. Labrum with palpi; magnified 44,5 diameters.

Fig. 6. Mandible; magnified 44,5 diameters.

Fig. 7. Maxilla; magnified 44,5 diameters.

Fig. 8. Outer maxillae; magnified 44,5 diameters.

Fig. 9—16. *Creusia spinulosa* Leach var. *sumbawae* n. var.

Fig. 9. Shell attached to a specimen of *Heteropsammia*; magnified 3,5 diameters.

Fig. 10. Same specimen seen from above; magnified 10,5 diameters.

Fig. 11. *a* and *b*, scutum and tergum, internal view; magnified 10 diameters.
c, scutum, external view; magnified 10 diameters.

Fig. 12. Labrum, with right-hand palpus; magnified 64 diameters.

Fig. 13. Mandible; magnified 64 diameters.

Fig. 14. Maxilla; magnified 64 diameters.

Fig. 15. Outer maxillae, inner lobes; magnified 64 diameters.

Fig. 16. Sixth cirrus, two of the middle segments; magnified 64 diameters.

Fig. 17—22. *Chthamalus stellatus* Poli.

Fig. 17. Shell seen from above; magnified 4 diameters.

Fig. 18. *a* and *b*, scutum and tergum, internal view; magnified 18 diameters.

Fig. 19. Labrum with palpi; magnified 80 diameters.

Fig. 20. Mandible; magnified 80 diameters.

Fig. 21. Maxilla; magnified 80 diameters.

Fig. 22. Pectinated spines from the last segments of the cirrus of the 2nd pair; magnified 214 diameters.

P. P. C. Hoek del.

PYRGOMA—CREUSIA—CHTHAMALUS.

Fa. P. W. M. Trap impr.

THE CIRRIPEDIA OF THE SIBOGA-EXPEDITION

Siboga-Expeditie
XXXI

THE

CIRRIPEDIA OF THE SIBOGA-EXPEDITION

BY

P. P. C. HOEK

With 27 plates and 2 textfigures

LATE E. J BRILL
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INTRODUCTION

A large and interesting collection of Cirripedia was made during the cruise (1899—1900) of H. M. S. "Siboga" in the Malay Archipelago. The collection is rich in species; they were brought together, partly during coast- and reef-exploration, and partly when the bottom of the sea was explored with the dredge, the naturalist's trawl, and other apparatus. A relatively large number of the species were found to be new to science; several of the species already known were particularly interesting since they were described in DARWIN's Monograph, but have not or not very carefully been observed since the publication of that work.

The material has been worked up to a large extent for the determination of the species, and secondly for the study of their geographical and bathymetrical distribution. Although the collection was a rich one, only very few species, and not always the more interesting ones, were represented by specimens sufficiently numerous to provide materal for anatomical research; moreover, although the state of preservation of the material was generally good for microscopical, histological and other research, it could not, of course, be compared with fresh material, as this can now be had and investigated in marine stations all over the world. Consequently, details of the animal's structure were examined and the results inserted in the report, only in such cases in which this was useful or necessary for the identification of the species.

The greater part of the collection was handed over to me towards the end of 1900, the rest, in the beginning of 1901. A first instalment of the report (containing the description of the Cirripedia Pedunculata) was ready for the press at the end of the year 1906, and was published in October 1907; the second part of the report (containing the description of the Cirripedia Sessilia: Verrucidae and Balanidae) was finished towards the end of September 1912, and sent to the press in October of that year.

During the cruise through the Malay Archipelago, H. M. S. "Siboga" explored that part of the Archipelago which is situated to the East of Java, Madura, Bawean Island and Borneo, and extends as far north as the Sulu Sea and Talaut Islands, as far east as the Aru Islands, and as far south as Rotti Island. The first station was visited on March 7, 1899, the last (N^{0} 323) on February 25, 1900. At about 100 of the 323 stations, and, moreover, at a dozen coast-places, where shore-exploration was carried out, species of Cirripedia were found and collected.

The total number of species of Cirripedia represented in the Siboga-collection amounts

to 114, 75 of which are to be described as new species. They belong to 18 different genera, two of which are introduced to science as new. They can be arranged in the following way:

NAME OF GENUS	Number of species	Number of new species
Lepas Linn.	2	—
Poecilasma Darwin	7	3
Dichelaspis Darwin	5	4
Megalasma Hoek	2	1
Alepas S. Rang.	5	5
Microlepas n. gen.	1	1
Ibla Leach.	2	1
Scalpellum Leach	38 (1 spec. with 2 var.)	32
Pollicipes Leach.	1	—
Lithotrya G. B. Sowerby.	4	1
Verruca Schumacher	7	6
Balanus Auctor.	26 (2 spec. with numerous var.)	16
Acasta Leach	2 (3)	1 (2)[1]
Hexelasma n. gen.	2	2
Tetraclita Schumacher	4	—
Pyrgoma Leach	3	2
Creusia Leach.	1 (2 var.)	—
Chthamalus Ranzani	2	—
Total.	114	75

Here follows a list of all the species collected, arranged according to the depth at which they were found to occur:

NAME OF SPECIES	Depth at which collected
Lepas anserifera Linn	Floating objects, keel of H.M.S. "Siboga", etc.
Lepas fascicularis Ell. & Soll.	Floating objects.
Balanus tintinnabulum Linn. var. *validus* Darw.	Keel of H. M. S. "Siboga".
Balanus tintinnabulum Linn. var. *costatus* n. var.	
Balanus tintinnabulum Linn. var. *plicatus* n. var.	
Alepas lithotryae n. sp.	Reef-exploration.
Ibla Cumingi Darwin	Reef- and shore-exploration.
Ibla sibogae n. sp.	Shore-exploration.
Pollicipes mitella Linn.	Shore-exploration.
Lithotrya conica n. sp.	Reef-exploration.

[1] The present report contains the description of a third (a second new) species of *Acasta* which was also collected of late in the Malay Archipelago, but which was not represented in the Siboga collection.

NAME OF SPECIES	Depth at which collected
Lithotrya nicobarica Rhdt.	Reef-exploration.
Lithotrya pacifica Borrad.	Shore-exploration.
Lithotrya truncata Quoy & Gaimard	Shore-exploration.
Tetraclita porosa (Gmel.)	Reef-exploration.
Tetraclita costata Darwin	Reef-exploration.
Tetraclita vitiata Darwin	Reef-exploration.
Tetraclita coerulescens Spengler	Reef-exploration.
Chthamalus stellatus Poli	Shore-exploration, reef-exploration.
Scalpellum Peroni (Gray)	Coast- or shore-exploration.
Poecilasma fissum Darwin	Shore.
Pyrgoma grande G. B. Sowerby jun.	Shore.
Balanus arcuatus n. sp.	9—36 m.
Dichelaspis Tydemani n. sp.	10—25 m.
Pyrgoma jedani n. sp.	—13 m.
Balanus bimae n. sp.	13—31 m.
Balanus amaryllis Darwin	13—40 m.
Balanus amphitrite Darwin	13—56 m.
Scalpellum rostratum Darwin	13—94 m.
Acasta glans Lamarck	18—45 m.
Balanus socialis Hoek	18—91 m.
Dichelaspis Nierstraszi n. sp.	18—120 m.
Chthamalus intertextus Darwin	22 m.
Balanus auricoma n. sp.	27—90 m.
Dichelaspis Versluysi n. sp.	32 m.
Balanus quinquevittatus Darw.	32 m.
Balanus calceolus Ellis	32 m.
Balanus cornutus n. sp.	32 m.
Balanus quadrivittatus Darwin	32—34 m.
Scalpellum uncus n. sp.	34—296 m.
Balanus ciliatus n. sp.	34—113 m.
Creusia spinulosa Leach var. *sumbawae* n. var.	—36 m.
Microlepas diademae n. gen. n. sp.	36 m.
Balanus longirostrum n. sp.	36 m.
Balanus hystrix n. sp.	—40 m.
Poecilasma eburneum Hinds	40—90 m.
Dichelaspis orthogonia Darwin	40—120 m.
Acasta conica n. sp.	—45 m.
Balanus navicula Darwin	45 m.
Creusia spinulosa Leach var. (11) Darwin	—52 m.
Balanus terebratus Darwin	—52 m.
Scalpellum pollicipedoides n. sp.	57 m.
Balanus maculatus n. sp.	69—73 m.
Balanus maldivensis Borrad.	69—390 m.
Dichelaspis orthogonia (forma dubia)	73—88 m.

NAME OF SPECIES	Depth at which collected
Balanus investitus n. sp.	73—90 m.
Scalpellum aries n. sp.	75—94 m.
Balanus proripiens n. sp.	75—94 m.
Balanus compressus n. sp.	75—112 m.
Balanus minutus n. sp.	80 m.
Alepas intermedia n. sp.	90 m.
Balanus albus n. sp.	90—522 m.
Alepas tenuis n. sp.	204 m.
Scalpellum imbricatum n. sp.	204 m.
Scalpellum diota n. sp.	204 m.
Scalpellum candidum n. sp.	204 m.
Pyrgoma kuri n. sp.	204 m.
Poecilasma dubium n. sp.	204—304 m.
Poecilasma obliquum n. sp.	204—304 m.
Balanus pentacrini n. sp.	204—304 m.
Scalpellum Stearnsi Pilsbry var. *robusta* n. var.	204—330 m.
Hexelasma velutinum n. gen. n. sp.	204—390 m.
Megalasma striatum Hoek.	204—984 m.
Balanus tenuis Hoek	275 m.
Poecilasma excavatum n. sp.	289—304 m.
Verruca conchula n. sp.	310—520 m.
Scalpellum hamulus n. sp.	397 m.
Scalpellum pellicatum n. sp.	397—450 m.
Scalpellum polymorphum n. sp.	397—794 m.
Scalpellum praeceps n. sp.	411 m.
Scalpellum Stearnsi Pilsbry var. *gemina* n. var.	450 m.
Verruca grex n. sp.	450—984 m.
Megalasma lineatum n. sp.	450 m.
Scalpellum fissum n. sp.	462—472 m.
Verruca capsula n. sp.	520—1301 m.
Poecilasma gracile Hoek.	521 m.
Alepas morula n. sp.	538 m.
Dichelaspis Weberi n. sp.	560 m.
Hexelasma arafurae n. gen. n. sp.	560 m.
Balanus alatus n. sp.	564 m.
Scalpellum deforme n. sp.	655 m.
Scalpellum proclive n. sp.	655 m.
Scalpellum crinitum n. sp.	794 m.
Scalpellum curiosum n. sp.	794 m.
Verruca cassis n. sp.	794—1600 m.
Scalpellum chitinosum n. sp.	794—1788 m.
Scalpellum incertum n. sp.	798 m.
Poecilasma carinatum Hoek	828—1633 m.
Scalpellum acutum Hoek.	845—1264 m.

NAME OF SPECIES	Depth at which collected
Scalpellum poculum n. sp.	918 m.
Verruca casula n. sp.	924 m.
Verruca navicula n. sp.	924—959 m.
Alepas ovalis n. sp.	984 m.
Scalpellum javanicum n. sp.	1018 m.
Scalpellum humile n. sp.	1158 m.
Scalpellum gracile n. sp.	1158 m.
Verruca nitida Hoek.	1301 m.
Scalpellum distinctum Hoek	1301—2218 m.
Scalpellum sessile n. sp.	1570 m.
Scalpellum formosum n. sp.	1570—2081 m.
Scalpellum moluccanum Hoek	1788 m.
Scalpellum inflatum n. sp.	1788 m.
Scalpellum elegans n. sp.	1886 m.
Scalpellum virgatum n. sp.	2050 m.
Scalpellum ventricosum n. sp.[1]	2050 m.
Scalpellum ciliatum n. sp.	2081 m.
Scalpellum trapezoideum n. sp.	2796 m.
Scalpellum hexagonum n. sp.	2798 m.
Scalpellum sculptum n. sp.	2798 m.
Scalpellum discolor n. sp.	2798 m.

We see at once from this list that the bathymetrical distribution of the Cirripedia follows the same rules in the Malay Archipelago as it does in other parts of the world, or in the world's oceans in general. In this respect a comparison of this list with the one published on pp. 21—22 of my report on the Cirripedia of the Challenger-expedition may be instructive. The number of species collected during shore-exploration, or when exploring coral reefs is important in the present list, whilst only very few species were collected in that way during the cruise of the Challenger. Such is the case with the Cirripedia from shallow water, which are also much more numerous in the Siboga-collection. The two collections, however, agree in so far as both the coast- and shallow-water forms belong to numerous and very different genera, this not being the case with the species occurring in deeper water, let us say, of more than 200 m. depth. Although the "Subclass" is there still represented by numerous species, the number of genera diminishes considerably until we come to still greater depths, where practically only two genera are represented: *Verruca* and *Scalpellum*. Of the 77 Challenger-Cirripedia, 31 were collected at depths less than 500 mm., and 46 in deeper water. Of these, 41 belong to the two genera *Verruca* and *Scalpellum*, 2 to *Poecilasma*, 1 to *Alepas*, 1 to (*Balanus*) *Hexelasma* and 1 to *Dichelaspis*. Of the 114 species collected by the Siboga 79 come from depths less than 500 m., 35 from deeper water. Of these, 28 belong to *Verruca* and *Scalpellum*, 7 to other genera: 2 to *Poecilasma*, 2 to *Alepas*, 1 to *Dichelaspis*, 1 to

[1] This name is to take the place of *Sc. arcuatum*, used already by DARWIN for a fossil species.

Hexelasma and 1 to *Balanus*. The latter genus seems to occur only exceptionally so far down as 564 m. (*B. alatus* n. sp.) and can safely be considered a true shallow-water genus. *Hexelasma*, which is nearly related to *Balanus*, represents the deep-water form of that species; *Poecilasma*, *Alepas* and *Dichelaspis* are shallow-water genera, some species of which occur at considerable depths. This is, after all, also the case with the genera *Verruca* and *Scalpellum*, the difference being that the number of deep-sea species of these latter genera is much more considerable, and, in the second place, that they occur at much greater depths. In both respects *Scalpellum* still greatly surpasses *Verruca*: when we descend, in the Malay Archipelago, to depths of more than 1300 m., the only species of Cirripedia we meet with belong to the genus *Scalpellum*. The Cirripedia of the Challenger-expedition showed the same peculiarity, although a species of *Verruca* was still collected at a depth of 3400 m., *Scalpellum* was the only genus occurring at still greater depths, from 3600—5000 m.

On the other hand, we must not forget that these genera, *Scalpellum* and *Verruca*, although inhabiting great depths, are represented also in shallow water, and are found even on the shore in single species (*Sc. Peroni* (Gray), *Verruca strömia* (Müller)). We may therefore conclude that these genera occur at any depth, but that the number of species increases if we proceed from less deep into deeper parts of the sea, while the other genera either have no species at all in deeper water (*Pollicipes*, *Pyrgoma*, *Tetraclita* etc.), or, although showing the greatest distribution in shallow water, are represented also in much deeper water (*Alepas*, *Dichelaspis*, *Poecilasma*, *Balanus* etc.) with a few or a single species. In this respect the genera *Megalasma* and *Hexelasma* seem to occupy a special position: though they have not been observed at very great depths, say of more than 1000 m., all the species we know are found in deeper water, ranging from about 100 to 900 m. So when it comes to the point they would be the only true deep-sea genera of Cirripedes at present known.

With few exceptions, the deep-sea species were met with only once: the greater the depth, the more seldom is a species collected that was already found at another station. Most of these deep-sea species are, moreover, represented only by a single or few specimens. This is partly explained by the way in which the material from the bottom of the sea is collected, and may be partly due to the fact, that these species live somewhat isolated, not forming dense aggregations as do commonly the floating species of *Lepas* and the shallow-water-species of *Balanus* and other genera. But, perhaps, our opinion on this point would be different if we could investigate the depths of the ocean in the same way as we can explore a meadow, counting if we like the specimens of wild plants occurring there. When discussing the geographical distribution of the Cirripedia of the Malay Archipelago we will have to return to this subject. With regard to the true deep-sea species of *Scalpellum*, it may here be pointed out that the size of the Siboga-specimens was by no means so remarkable as was the case with the species collected by the Challenger. The latter could truly be said to show that the conditions of life in the deep-sea by no means exercised a dwarfing effect upon these animals, for they contain the largest forms of pedunculate Cirripedia observed. On the contrary, the species of *Scalpellum* from the greatest depths collected by H. M. S. "Siboga", are all of medium size or even small species. The only really large form of *Scalpellum* represented is *Sc. Stearnsi*, and this has a

capitulum of from 45 to 52 mm. in length and was dredged at depths varying from 204 to 450 m.

As contributing to our knowledge of the geographical distribution of the Cirripedia, it is certainly a remarkable fact that so many as 75 new species should be collected during the cruise of the Siboga. With the addition of these new species and of those which, although already known, were not yet observed in that region, the Sixth Province, which I proposed for the East Indian Archipelago and eastern coasts of India (Challenger-Report p. 33), has become by far the richest in species. In the said report, I gave a list of the species known at the time (1883) to occur in that province; here follows a list of the genera now known to be represented in that region, showing at the same time how the number of species for each genus has increased since the former list was composed.

List of the genera of Cirripedia, with number of species, hitherto observed in the East Indian Archipelago and in the waters of South-Eastern Asia.

GENERA	1883, Hoek, Challenger Report p. 33	Species to be added to the list, on the authority of:														Species added to the list by H. M. S. "Siboga"		Total number hitherto observed
		Fischer, 1886	Hoek, 1887	Aurivillius, 1893	Weltner, 1894	Weltner, 1897	Borradaile, 1900	Gruvel, 1902	Lanchester, 1902	Gruvel, 1903	Borradaile, 1903	Gruvel, 1904	Annandale, 1905	Annandale, 1906	Gruvel, 1907	Annandale, 1909	known species	new species	
Lepas	4	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	6
Poecilasma . .	2	—	—	4	—	—	—	1	—	—	—	—	—	(1)	—	—	(2)	3	13
Dichelaspis . .	1	—	(1)	7	—	—	—	—	1	1	(1)	—	—	—	—	—	(1)	4	17
Oxynaspis . .	—	—	—	—	—	(1)	—	—	—	—	—	—	—	—	—	—	—	—	1
Conchoderma	—	—	—	—	—	—	—	—	—	—	(1)	—	—	—	—	—	—	—	1
Megalasma . .	1	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1	4
Alepas	—	—	—	1	—	—	—	1	—	—	—	—	2	1	—	—	—	5	10
Microlepas . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Ibla	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2
Scalpellum . .	15	—	—	—	1	—	—	—	—	—	—	—	2 & (3)	5 & (1)	—	1	(3)	32	63
Pollicipes . . .	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Lithotrya . .	2	—	—	—	—	—	1	—	—	—	(1)	—	—	—	—	—	—	1	5
Verruca . . .	1	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	6	11
Balanus . . .	13	—	—	—	—	(3)	—	—	1	—	1 & (1)	(1)	—	—	1 & (1)	—	—	16	38
Acasta	4	—	—	—	—	(1)	—	—	—	—	—	—	—	1 & (1)	—	—	(1)	2*	10
Hexelasma . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
Tetraclita . .	4	—	—	—	—	—	—	—	—	—	—	—	—	(1)	—	—	(1)	—	6
Pyrgoma . . .	4	—	—	—	—	(1)	—	—	—	—	1 & (1)	—	—	—	—	—	—	2	9
Pyrgopsis . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
Creusia	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Chelonobia . .	—	—	—	—	—	—	—	—	—	—	(2)	—	—	—	(1)	—	—	—	3
Stephanolepas	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Chthamalus .	2	—	—	—	—	(1)	—	—	—	—	—	—	—	—	—	—	—	—	3
Octomeris . .	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total number of species																			210

Note. The numbers in brackets refer to species already known, but new to the fauna of the province.

* One of these species is described in the present report, although it was not collected during the cruise of the Siboga.

The publications to which this list refers, are the following:

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1886. FISCHER, P., Description d'un nouveau genre de Cirrhipède. Actes Société Linnéenne de Bordeaux. XL. p. 193—196.

1887. HOEK, P. P. C., On *Dichelaspis pellucida*, Darwin. Journ. Linn Soc. (Zool.) XXI. p. 154.

1894. AURIVILLIUS, C. W. S., Studien über Cirripedien. K. Svensk. Vetensk. Akad. Hand. XXVI. N° 7.

1894. WELTNER, W., Zwei neue Cirripedien aus dem Indischen Ozean. Sitzungsber. d. Gesellsch. naturforschender Freunde zu Berlin. 1894. N° 2. S. 80.

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Most of these papers report on species of Cirripedia collected in Indian waters, outside the Malay Archipelago. The studies of AURIVILLIUS of 1894 are an exception, since his material was to a large extent of Javanese origin. This is also the case with numerous samples of Cirripedia found in the Berlin Museum, being those used by WELTNER for his List (Verzeichnis) of 1897. The latter, however, added no new species to the fauna of the Malay Archipelago, while AURIVILLIUS contributed twelve new species to the said region: 4 species belonging to *Poecilasma*, 7 to *Dichelaspis* and 1 to *Alepas*. To the same region belong also 3 species (1 *Lepas*, 1 *Dichelaspis* and 1 *Poecilasma*) described as new by GRUVEL, and 5 of ANNANDALE's new species (2 *Alepas*, 3 *Scalpellum*).

A complete list of the species of Cirripedia at present known to occur in the Malay Archipelago and in the waters along the Eastern coasts of India is here given. For sake of convenience, species attached to floating or swimming objects are also included.

NAME OF SPECIES	Where observed *in* the province	Depth in m.	Where observed *outside* the province
Lepas anatifera Linn.	Indian Ocean	Surface	Cosmopolitan
Lepas anserifera Linn.	Malay Archipelago; Indian Ocean	Surface	Cosmopolitan
Lepas denticulata Gruvel 1903.	Honda Bay (Philippines)	Surface	—
Lepas fascicularis Ell. & Sol.	Malay Archipelago	Surface	Cosmopolitan
Lepas Hilli (Leach)	Indian Ocean	Surface	Atlantic Ocean, Australia
Lepas tenuivalvata Annandale 1906	Coast of Ceylon	Surface	—
Poecilasma amygdalum Aurivillius 1894.	Java Sea; Andaman Isl.	?	—
*Poecilasma carinatum Hoek	Ceram Sea; S. of Timor	702–828–1633	West Indies; South Atlantic
*Poecilasma dubium n. sp.	S. of Kur Isl.; S. of Taam Isl.	204—304	—
Poecilasma eburneum Hinds.	New Guinea; Borneo-bank	40—90	Red Sea
*Poecilasma excavatum n. sp.	S. of Kangeang Isl.; S. of Taam Isl.	289—304	—
Poecilasma fissum Darwin.	Philippine Archipelago; Ternate anchorage	Shore	—
*Poecilasma gracile Hoek	Near Paternoster Isl.; S. of Timor	521	Off Sydney, Australia
Poecilasma Kaempferi Darwin (Annandale 1906)	Ceylon; Gulf of Manaar	774	Japan (probably also: Madeira; Mexico)
Poecilasma lenticula Aurivillius 1894	Java Sea	?	—
Poecilasma minutum Gruvel 1902	Singapore	Surface	—
*Poecilasma obliquum n. sp.	S. of Kur Isl.; S. of Taam Isl.	204—304	—
Poecilasma tridens Aurivillius 1894.	Philippines.	?	—
Poecilasma vagans Aurivillius 1894.	? East India (on Nautilus)	?	—
Dichelaspis alata Aurivillius 1894	Java Sea	?	—
Dichelaspis angulata Aurivillius 1894.	Id.	?	—
Dichelaspis aperta Aurivillius 1894.	Id.	?	—
Dichelaspis bullata Aurivillius 1894	Id.	?	—
Dichelaspis cuneata Aurivillius 1894	Id.	?	—
Dichelaspis equina Lanchester 1902	Trengganu; Ceylon; Ganjam coast	Shore	—
Dichelaspis ? Grayi Darw. (Borradaile 1903)	Maldives	?	Pacific
Dichelaspis Maindroni Gruvel 1903.	Sumatra	?	—
*Dichelaspis Nierstraszi n. sp.	Numerous places in the Malay Archipelago	18—120	—
*Dichelaspis orthogonia Darwin.	Borneo-bank; S. coast of Timor	40—120	—
Dichelaspis pellucida Darwin (Hoek 1887)	Indian Ocean; Mergui Archipelago; Ceylon	Surface	—
Dichelaspis sinuata Auriviltius 1894	Java Sea	?	—
Dichelaspis trigona Aurivillius 1894	Java Sea	?	—
*Dichelaspis Tydemani n. sp.	Saleyer anchorage	10—25	—
*Dichelaspis Versluysi n. sp.	S. of Salawatti; Tual anchorage	32	—
Dichelaspis Warwicki Gray	Off Borneo; Maldives; Java Sea	?	—
*Dichelaspis Weberi n. sp.	Kei Isl. Archipelago	560	Sagami-Bay (Japan)
Oxynaspis celata Darwin (Weltner 1897)	Luzon	?	Madeira; Japan; West-Australia
Conchoderma Hunteri (R. Owen) (Borradaile 1903)	Laccadives	Surface	Pacific Ocean; Japan
Megalasma carino-dentatum Weltner 1894	Indian Ocean	3146—3200	—
*Megalasma lineatum n. sp.	E. of Makassar	450	—
Megalasma minus Annandale 1906.	Andaman Sea	290—871	—
Megalasma striatum Hoek.	Off Luzon; S. of Taam Isl.; S. of Kur Isl.; E. of Kei Isl.; Philippine Archipelago	204—984	—
Alepas gigas Annandale 1905	Bali Straits	308	—
Alepas indica Gruvel 1902	Singapore; Nicobars	Surface	Japan
*Alepas intermedia n. sp.	N.W. from Key Isl.	90	—
*Alepas lithotryae n. sp.	Near South Lucipara Isl.	Shore	—
Alepas malaysiana Annandale 1905.	Gaspar Straits	54	—
*Alepas morula n. sp.	Between Borneo and Lombok	538	—
*Alepas ovalis n. sp.	W. from the Key Isl.	984	—
Alepas quadrata Aurivillius 1894.	Java Sea	?	Japan; Formosa
*Alepas tenuis n. sp.	S. of Ceram	204	—

* The species marked with an asterisk have not been observed before in this region.

NAME OF SPECIES	Where observed *in* the province	Depth in m.	Where observed *outside* the province
Alepas xenophorae Annandale 1906 . .	Off S.W. coast of India	333	—
*Microlepas diademae n. sp. n. gen. . .	Bay of Nangamessi (Sumba)	36	—
Ibla Cumingi Darwin	Philippine Archipelago; Strait Molo off Dongola	Shore	—
*Ibla sibogae n. sp.	Bay of Badjo; West coast of Lombok, Bay of Bima; Kwandang Sea	Shore	—
Scalpellum acutum Hoek (Annandale 1905)	Andaman Sea; Malay Archipelago	845—1264	Atlantic Ocean; Pacific, off Kermadec
Scalpellum album Hoek.	South of Mindanao	900	— [Isl.
Scalpellum alcockianum Annandale 1906	Gulf of Manaar; Andaman Sea	1546—1728	—
*Scalpellum aries n. sp.	North of Buton	75—94	—
Scalpellum australicum Hoek	Between New Guinea and Australia	2520	—
Scalpellum balanoides Hoek.	Banda Sea	232	—
Scalpellum bengalense Annandale 1906.	Bay of Bengal	180	—
*Scalpellum candidum n. sp.	Near Kei Isl.	204	—
*Scalpellum chitinosum n. sp.	N. of Sumbawa; W. of Aru Isl.	794—1788	—
*Scalpellum ciliatum n. sp.	S. of Ambon	2081	—
Scalpellum compressum Hoek	Celebes Sea	3870	—
*Scalpellum crinitum n. sp.	N. of Sumbawa	794	—
*Scalpellum curiosum n. sp.	N. of Sumbawa	794	—
*Scalpellum deforme n. sp.	Near Palos Bay, Celebes	655	—
*Scalpellum diota n. sp.	Near Kei Isl.	204	—
*Scalpellum discolor n. sp.	Banda Sea	2798	—
Scalpellum distinctum Hoek.	N. entrance of Strait of Malacca; W. of Buton Isl.	1301—2218	East of New Guinea (New Brittannia Archipelago)
Scalpellum dubium Hoek.	Between New Guinea and Australia	2520	—
*Scalpellum elegans n. sp.	W. of Buton Isl.	1886	—
*Scalpellum fissum n. sp.	W. of Halmaheira; S. of Celebes	462—472	—
*Scalpellum formosum n. sp.	S. of Ceram; S. of Ambon	1570—2081	—
*Scalpellum gracile n. sp.	E. of Saleyer	1158	—
Scalpellum Gruveli Annandale 1906 . .	Laccadives; Gulf of Manaar; Andaman Sea	1546—1840	—
*Scalpellum hamulus n. sp.	Kei Islands	397	—
*Scalpellum hexagonum n. sp.	Banda Sea	2798	—
Scalpellum hirsutum Hoek.	Moluccan Sea	1485	—
*Scalpellum humile n. sp.	E. of Saleyer	1158	—
*Scalpellum imbricatum n. sp.	Near Kei Isl.	204	—
*Sculpellum incertum n. sp.	Between Kofiau and New Guinea	798	—
Scalpellum indicum Hoek.	Banda Sea	232	—
Scalpellum inerme Annandale 1905 . .	Bali Straits	308	—
*Scalpellum inflatum n. sp.	W. of Aru Isl.	1788	—
Scalpellum japonicum Hoek (Annandale 1906)	Gulf of Manaar	1000—1077	Japan: S. of Niphon. 1000—1071 m.
*Scalpellum javanicum n. sp.	N. of Bali	1018	—
Scalpellum Kampeni Annandale 1909. .	S. of Bintang	23—29	—
Scalpellum laccadivicum Annandale 1906	Laccadives	2077	—
Scalpellum marginatum Hoek	North of New Guinea	3600	—
Scalpellum moluccanum Hoek	Banda Sea; West of Aru Isl.	1788—2565	—
Scalpellum novae-zelandiae Hoek (Annandale 1905).	Andaman Sea	882—1260	Australia: off Auckland
Scalpellum ovatum Hoek	North of New Guinea	3600	—
*Scalpellum pellicatum n. sp.	Kei Isl.; E. of Borneo.	397—450	—
Scalpellum Peroni (Gray)	Jedan Isl.	Shore	Australia: Swan River, Bass-straits
*Scalpellum poculum n. sp.	Near Rotti, S. of Timor	918	—
*Scalpellum pollicipedoides n. sp. . . .	East of Kei Isl.	57	—
*Scalpellum polymorphum n. sp. . . .	Kei Isl.; N. of Sumbawa	397—794	—
*Scalpellum praeceps n. sp.	Between Halmaheira and New Guinea	411	—
*Scalpellum proclive n. sp.	Near Palos Bay, Celebes	655	—
Scalpellum rostratum Darwin	Bay of Bima, Sumbawa; N. of Buton; W. of Saleyer; S. of Timor; Philippine Archipelago	13—94	—
Scalpellum rubrum Hoek	Off Luzon	180—207	—
*Scalpellum sculptum n. sp.	Banda Sea	2798	—
*Scalpellum sessile n. sp.	S. of Ceram	1570	—
Scalpellum sociabile Annandale 1905. .	Bali Strait	308	—

NAME OF SPECIES	Where observed *in* the province	Depth in m.	Where observed *outside* the province
Scalpellum squamuliferum Weltner 1894	Indian Ocean; Andaman Isl.	3200—3312	—
*Scalpellum Stearnsi Pilsbry	Near Kei Isl.; Madura Sea; W. of Makassar	204–330; 450	Japan
Scalpellum subflavum Annandale 1906	Gulf of Manaar; Andaman Sea	234—1260	—
Scalpellum tenue Hoek (Annandale 1905)	Bay of Bengal	1000—1071	South Indian Ocean: between the Crozets and Prince Edward Island
*Scalpellum trapezoideum n. sp.	South of Celebes	2796	—
Scalpellum trispinosum Hoek	Basilan Strait, Philippine Archipelago	147—184	Japan
Scalpellum truncatum Hoek	Between New Guinea and Australia; ? Gulf of Manaar	? 1002—2520	—
*Scalpellum uncus n. sp.	S. coast of Timor; Bay of Bima, Sumbawa	34—296	—
*Scalpellum ventricosum n. sp.	S. of Timor	2050	—
Scalpellum villosum Sowerby	Eastern Seas	?	?
*Scalpellum virgatum n. sp.	S. of Timor	2050	—
Pollicipes mitella (Linn.)	Philippine Archipelago; Madura Bay; Bay of Badjo (W. coast of Flores)	Shore	East-Asia: Japan; Madagascar; Hawaii
*Lithotrya conica n. sp.	Reef near Lucipara Isl.; Reef near Kur. Isl.	Shore	—
Lithotrya dorsalis (Ellis) var. (Borradaile 1903)	Maldives	Shore	West-India (the species itself)
Lithotrya nicobarica Rhdt.	Timor; Nicobar Isl.; Reef near Lucipara Isl.; Reef near Kur Isl.	Shore	—
Lithotrya pacifica Borradaile 1900	Reef of Funafuti; E. coast of Lombok	Shore	—
Lithotrya truncata (Quoy & Gaim.)	Philippine Archipelago; Samau Isl., Timor	Shore	Pacific Ocean
*Verruca capsula n. sp.	Strait of Makassar; Kei Isl. Archipelago; E. of Rotti Isl.	520—1301	—
*Verruca cassis n. sp.	Near N. coast of Sumbawa; W. of Waigeu Isl.; S. of East point of Timor	794—1600	—
*Verruca casula n. sp.	Between Ceram and New Guinea	924	—
*Verruca conchula n. sp.	? Kei Isl. Archipelago; E. of Rotti Isl.	310—520	—
Verruca cristallina Gruvel 1907	Andamans Isl., Cape Bluff; Cinque Isl.	768—785	—
*Verruca grex n. sp.	E. of Makassar; E. of Kei Isl.; E. of Rotti Isl.	450—984	—
Verruca Koehleri Gruvel 1907	Andaman Isl.	435	—
Verruca multicostata Gruvel 1907	Malacca Strait	160	—
*Verruca navicula n. sp.	Between Flores and Sumba; between Ceram and New Guinea	924—959	—
Verruca nitida Hoek	S. of Mindanao; Strait of Makassar	900—1301	—
Verruca plana Gruvel 1907	Andaman Isl. passage	380—465	—
Balanus aeneas Lanchester (Annandale 1906)	Malacca; Ceylon	?	—
Balanus ajax Darwin	Philippine Archipelago	?	—
*Balanus alatus n. sp.	Sulu Sea	564	—
*Balanus albus n. sp.	S. of Kangeang Isl.; Sulu Sea; Kei Isl.	90—522	—
Balanus allium Darwin (Weltner 1897)	Ceylon	Shore	Australia, Rainet's Islet, Barrier Reef; Red Sea
Balanus amaryllis Darwin	East Indian and Philippine Archipelago	0—40	Australia, North East Coast; Moreton Bay; Kobe, Japan; Shanghai. Attached to ships'-bottoms.
Balanus amphitrite Darwin	Different places in the East Indian Archipelago	0—56	Cosmopolitan: warmer temperate and tropical seas; common on ships'-bottoms
*Balanus arcuatus n. sp.	Banda	9—36	—
*Balanus auricoma n. sp.	Ternate; Kei Isl. (?)	27—90	—
*Balanus bimae n. sp.	Bay of Bima (Sumbawa)	13—31	—
Balanus calceolus Ellis (Weltner 1897)	Guinea; S. of Salawatti (W. of New Guinea)	32	West coast of Africa; Australia; Japan
Balanus carenatus Gruvel 1907	Akyab, Birma	?	—
Balanus cariosus Pallas (Gruvel 1904)	Cochin China	?	Alaska; Japan; Behrings Straits; Kurile Islands; W. coast of North America
*Balanus ciliatus n. sp.	Between Adonara and Solor (E. of Flores)	34—113	—
*Balanus compressus n. sp.	Between Wowoni and Button; S. of Timor	75—112	—
Balanus concavus Brown	Philippine Archipelago	?	California; Panama; Peru; Australia
*Balanus cornutus n. sp.	S. of Salawatti (W. of New Guinea)	32	—
Balanus cymbiformis Darwin	Near Madras	?	—
Balanus eburneus A. Gould (Weltner 1897)	Manila; Indian Ocean	Surface	United States; West-Indies: attached to floating wood, ships'-bottoms, etc.; Europe

NAME OF SPECIES	Where observed *in* the province	Depth in m.	Where observed *outside* the province
*Balanus hystrix n. sp.	Ambon	--40	—
*Balanus investitus n. sp.	E. coast of Sumbawa	73—99	—
*Balanus longirostrum n. sp.	Off Dongola (N.W. Celebes); ? Batjan	36	—
*Balanus maculatus n. sp.	Sapeh Strait; E. coast of Sumbawa	69—73	—
Balanus maldivensis Borradaile 1903	Maldives; Ceylon; Malay Archipelago	69—390	—
*Balanus minutus n. sp.	Kwandang-Bay entrance (N. coast of Celebes)	80	—
Balanus navicula Darwin	Madras; near Damar Isl. (S. of Halmaheira)	45	—
Balanus patellaris (Gmel.) Spengler.	Bengal; Philippine Archipelago	?	Malabar coasts; Ganges
*Balanus pentacrini n. sp.	S. of Kur Isl.; S. of Taam Isl.	204—304	—
Balanus perforatus Brug. (Gruvel 1907).	Andaman Isl.	Shore	Atlantic; Mediterranean
*Balanus proripiens n. sp.	Between Wowoni and Button (S.E. of Celebes)	75—94	—
Balanus quadrivittatus Darwin.	East Indian Archipelago; Maldives; Philippine Archipelago	32—34	—
*Balanus quinquevittatus n. sp..	S. of Salawatti (W. of New Guinea)	32	—
Balanus socialis Hoek	Arafura Sea; numerous other places in the East Indian Archipelago	18—91	—
Balanus stultus Darwin	Singapore	?	? West-Indies
Balanus tenuis Hoek	Off Luzon; Philippine Archipelago	180—275	—
Balanus terebratus Darwin (Borradaile 1903)	Maldives; Ceylon; Kei Isl.	—52	—
Balanus tintinnabulum Linn.	Different places in the East Indian Archipelago	Shore and Surface	Almost cosmopolitan; common on ships'-bottoms
Balanus trigonus Darwin	Java; East Indian Archipelago	?	Atlantic; Red Sea; North and South pacific; Japan
*Acasta conica n. sp.	Pulu Barang (near Makassar)	—45	—
Acasta cyathus Darwin (Annandale 1906)	Gulf of Manaar	?	Madeira; West Indies
Acasta fenestrata Darwin	Philippine Archipelago	?	—
Acasta funiculorum Annandale 1906	Gulf of Manaar	?	—
*Acasta glans Lamarck	Pepela-Bay (Rotti Isl.); Java Sea	18—45	Southern Australia
Acasta laevigata Gray	Philippine Archipelago	?	Red Sea
*Acasta nitida n. sp.	Java Sea	40—50	—
Acasta purpurata Darwin	Sumatra; Philippine Archipelago	?	—
Acasta sporillus Darwin.	Sooloo Isl.	?	—
Acasta sulcata Lam. (Weltner 1897)	Philippine Archipelago; Maldives	4	Australia; Japan
*Hexelasma arafurae n. gen., n. sp.	Kei Isl. Archipelago	560	—
*Hexelasma velutinum n. gen., n. sp.	W. Entrance of Samau Strait (near Timor) N. of Sulu Isl.	204—390	—
Tetraclita coerulescens (Spengler)	Philippine Archipelago; Banda	Shore	Attached to a ships'-bottom from the Pacific
Tetraclita costata Darwin	Philippine Archipelago; Banda	Shore	—
Tetraclita porosa (Gmelin)	Philippine Archipelago; off Beo; Waigu Isl.; Lucipara Isl.	Shore	West-Indies; Galapagos Archipelago; China; Japan; Australia; Red Sea
Tetraclita radiata de Blainv.	(On a ship) from Sumatra	Surface	West-Indies; New South Wales; attached to ships
Tetraclita serrata Darwin (Annandale 1906)	Off Ceylon	Shore	Cape of Good Hope; Algoa Bay
Tetraclita vitiata Darwin	Philippine Archipelago; S. of Lucipara Isl.	Shore	Australia: Barrier Reef (Raine's Islet)
Pyrgoma anglicum Sowerby (Weltner 1897)	Singapore	22—72	Atlantic; Mediterranean
Pyrgoma cancellatum Leach (Borradaile 1903)	Maldives	47	? West-Indies
Pyrgoma conjugatum Darwin (Weltner 1897)	Ceylon	Shore	Red Sea
Pyrgoma crenatum Sowerby	Singapore; Philippine Archipelago; New Guinea	?	—
Pyrgoma grande G. B. Sowerby Jr.	Maldives; Singapore; East Indian Archipelago	Shore	—
Pyrgoma jedani n. sp.	Jedan Isl., S. of New Guinea	—13	—
*Pyrgoma kuri n. sp.	S. of Kur Isl., Kei Isl.	204	—
Pyrgoma madreporae Borradaile 1903.	Maldives	?	—
Pyrgoma milleporae Darwin.	Philippine Archipelago	?	—
Pyrgoma monticulariae J. S. Gray	Singapore	?	—
Pyrgopsis Annandalei Gruvel 1907.	Andaman Isl.	90	—
Creusia spinulosa Leach	Singapore; Philippine Archipelago; Coast of Sumbawa	—36; —52	Throughout the tropical seas, in numerous varieties

NAME OF SPECIES	Where observed *in* the province	Depth in m.	Where observed *outside* the province
Chelonobia caretta (Spengler) (Borradaile 1903)	Minikoi, Maldives	Surface	W. coast of Africa; northern Australia
Chelonobia patula Ranz. (Gruvel 1907).	Akyab, Birma	Surface	Mediterranean; Gambia; W. Africa; Brazil; Jamaica; Australia
Chelonobia testudinaria (Linn.) (Borradaile 1903)	Minikoi, Maldives	Surface	Mediterranean; W. coast of Africa; coast of Australia; Pacific; Japan; W. coast of Mexico
Stephanolepas muricata P. Fischer 1886.	Cochin China	?	—
Chthamalus dentatus Kraus (Weltner 1897)	Singapore	Shore	S. and W. Africa; West-Indies; attached to ships'-bottoms
Chthamalus intertextus Darwin.	Philippine Archipelago; near Kangeang Isl., N. of Bali	22	—
Chthamalus stellatus Poli spec.	Philippine Archipelago; coast of Lombok; coast of Sumbawa	Shore	Atlantic; Mediterranean; West-Indies; Brazil; Red Sea; China; Gulf of Korea; California
Octomeris brunnea Darwin	Philippine Archipelago	?	—

This list contains the names of 210 species. Of these, however, 30 have not been observed as yet in the Malay Archipelago. It seems certain that at least part of them will be found there eventually, for these species inhabit the south-eastern part of Asia, which has numerous species in common with the said Archipelago. Of course, the same is the case, at least to a certain extent, with the Malay Archipelago and the seas of Eastern-Asia (China, Japan, etc.) to the North of the region, and of Australia to the South of it. Yet there is an important difference between the latter regions and the Malay Archipelago: while they both extend from the tropical and sub-tropical regions far into the temperate zone, and, in consequence, are also inhabited by several species which are peculiar to the latter, the whole of the Malay Archipelago lies below the tropics. Nevertheless, the list of species representing the fauna of the latter region combined with that of Southern-Asia contains the names of several species, the distribution of which can be followed either into Australia or into the waters of China, Japan, etc.

When discussing the geographical distribution of the species of Cirripedia, we commonly leave out of consideration those species that always are found to live attached to floating objects, drift wood, ships'-bottoms, and the like. Their distribution is generally supposed to be a very wide one, if not always a cosmopolitan one. In fact, some of these species are observed all over the world's surface, as for example several species of *Lepas* and *Conchoderma*; but other species of the genus *Lepas* have a more or less limited distribution, so far as our knowledge goes at present. This seems to be the case also with several species of Cirripedia that are sometimes found attached to floating objects, but which live also on rocks, stones, shells, etc. and are collected even at not quite unimportant depths: *Balanus tintinnabulum* Linn., *B. amphitrite* Darwin, and *B. amaryllis* Darwin are good examples of this case. They have no doubt a wide distribution, yet they are observed only in warmer, temperate, and tropical seas. Again, we know species that are found on ships'-bottoms, which are also dredged either in shallow or in relatively deep water, and have a wide distribution in the temperate zone, but which do not seem to be altogether absent from warmer seas. Such species are *B. improvisus*

Darwin, and *B. crenatus* Brug., of which the latter ranges even into the Arctic Ocean. Altogether, the distribution of these species is not only a wide one, but at the same time a peculiar one, both species having the capability of resisting extreme conditions.

Coming now to those species that are always found attached to objects — stones, rocks, shells, corals — of the sea-bottom, we are strongly impressed by the facts, (1) that by far the greater part have only a very limited distribution, and (2) that only very few species are known which inhabit this East Indian region, and are found also in the Atlantic Ocean.

With regard to the limited distribution of the majority of the species, we must not forget that the species from deeper water form a high percentage of our list, and that, to say the least, we are not so well informed with respect to the distribution of those species. If we take the genus *Scalpellum*, represented in this province — so far as our knowledge goes at present — by 63 species, we know of only 8 of these species occurring also outside the province. Three of these were observed in Japan waters, and three in Australia, one was taken in the southern part of the Indian Ocean (between the Crozets and Prince Edward Island), and only one quite outside the region: at different places in the Atlantic, etc. This latter species is *Scalpellum acutum* mihi. It is a small species — but an interesting one. The "Challenger" dredged it at:

Station 78. Near the Azores at a depth of 1800 m.
„ 170. Near Kernadec Isl., Pacific, at depths of 936 and 1134 m.

The "Talisman" took it:

near the coast of Portugal at a depth of 1923 m.

The "Investigator" found it:

Andaman Sea, at a depth of 882 m.

and finally the "Siboga" met with it again at:

Station 122. North of Menado (Celebes), at a depth of 1165—1264 m.
„ 151. W. of Waigeu Island, at a depth of 845 m.
„ 211. N. of Saleyer Islands, at a depth of 1158 m.

It is the only species of *Scalpellum* known to have such a world-wide distribution, and it is a true deep-sea species. The only other deep-water Cirripedia that were observed in the Malay Archipelago and in the Atlantic Ocean as well, are two species of *Poecilasma*. The first is *Poecilasma carinatum* Hoek. The "Challenger" collected it on two occasions, viz.

Station 24. Off Culebra (West Indies). Depth 700 m.
„ 344. Off Ascension Island (South Atlantic). Depth 756 m.

Gruvel mentions specimens taken at a depth of 600—900 m. near the coast of Cuba.

The "Michaël Sars" (Atlantic Expedition of 1910) met with the same species at:

Station 53. S. of the Azores. Depth 2615—2865 m.

The "Siboga" collected it at the following stations:

Station 177. Ceram Sea. Depth 1633 m.
„ 284. S. of Timor. Depth 828 m.

The other species of *Poecilasma* that seems to inhabit both oceans is Darwin's *Poecilasma*

Kaempferi. DARWIN gave this name to a species from Japan which was found attached to *Inachus Kaempferi* de Haan, a crab "probably from deep water". But the same author, when describing *P. aurantium* from Madeira, pointed out that this species "has the closest general resemblances to *P. Kaempferi* and is evidently a representative of it". "On close examination, however", DARWIN says, "almost every part differs slightly" and his Monograph contains an enumeration of these differences. Thereupon GRUVEL, 1903, when investigating specimens of a *Poecilasma*-species, collected at depths varying from 355—782 m. near Cape Bojador, at a short distance from Madeira, found that some of these corresponded to DARWIN's *P. Kaempferi*, and the others to his *P. aurantium*, but that the differences between the specimens of the two sets were unimportant and not sufficient to justify the maintenance of two different species. He investigated specimens of *P. Kaempferi* of the British Museum-collections (whether they were DARWIN's types from Japan, or came from Japan at all, he does not say) and his conclusion was that the Japan and the Madeira forms belong to the same species, the latter form developing moreover into an orange-coloured variety: *P. Kaempferi* var. *aurantium*. Hence *Poecilasma Kaempferi* Darwin would also be a species found in both great oceans of the world.

But these are the only specimens of deep-sea Cirripedes that I know to be observed in the Malay Archipelago or eastern seas in general and in the Atlantic Ocean as well: all the other deep-sea species of *Scalpellum*, of *Verruca*, and other genera, are peculiar to one region, or only inhabit, if they are found in any other province, the adjacent one — Australia, China Sea, etc.

A few of the species collected at moderate depths in the region now under consideration, but which were never observed attached to floating objects, have also a wide distribution. I found them to be the following:

Oxynaspis celata Darwin	Luzon	and also:	Madeira
Pollicipes mitella (Linn.)	Malay Archipelago	„	„	: Madagascar
Lithotrya dorsalis Ellis	Maldives	„	„	: West-Indies etc.
Balanus calceolus Ellis	Malay Archipelago	„	„	: West coast of Africa
„ *concavus* Bronn	Philippine Archipelago	„	„	: California; Panama; Peru
„ *perforatus* Brug.	Andaman Isl.	„	„	: Mediterranean; Atlantic
„ *trigonus* Darwin	Malay Archipelago	„	„	: Atlantic; Peru; California
Acasta cyathus Darwin	Gulf of Manaar	„	„	: Madeira; West-Indies
Tetraclita porosa (Gmelin)	Philippine Archipelago	„	„	: West-Indies; Galopagos etc.
„ *serrata* Darwin	Off Ceylon	„	„	: Cape of Good Hope; Algoa Bay
Pyrgoma anglicum Sowerby	Singapore	„	„	: Atlantic; Mediterranean
Chthamalus stellatus Poli	Philippine Archipelago	„	„	: Atlantic; West-Indies, Brazil.

Perhaps *Balanus stultus* Darwin from Singapore, and *Pyrgoma cancellatum* Leach, which according to BORRADAILE inhabits the Maldives, and are both recorded by DARWIN from the West-Indies, but with a point of interrogation, must be added to this list. This may be also the case with *Balanus declivis* Darwin: DARWIN instituted the species for a barnacle living embedded in sponges at the West-Indies, and WELTNER determined as belonging to the same species specimens from Batjan, which MARTENS collected, and which lived with *Acasta*,

in a sponge. Now, the Siboga collected a species of *Balanus* at different places in the Malay Archipelago, living also in sponges, and certainly showing great resemblance to *B. declivis* Darwin. I have thought better, however, observing some differences between DARWIN's description of *B. declivis* and the Siboga-specimens, to describe the latter as a new species, and I proposed for it the name *Balanus longirostrum*. For the present, however, this species may be considered as a representative of *B. declivis* from the West-Indies.

But even if we add the latter species to the above list, the number of species found to be distributed so very widely remains a small one, small at least, if we compare it with the great number of species that are known only from the region under consideration. And this warrants us to consider this region as a special province — and this is, as we are well enabled to say now — an especially rich province in the geographical distribution of the Cirripedia. It is certainly true that even a larger number of species, each, however, represented only by few specimens, cannot exercise such a strong influence on the character of a fauna, as a much smaller number of forms that occur in larger quantities will do. Whether from that point of view the barnacles of the coastal region of the Malay Archipelago may stand comparison with those of most other regions of the earth surface, I had no opportunity to make out. But certainly it has been proved, by the investigations of AURIVILLIUS, BORRADAILE, and ANNANDALE, and of myself with the aid of the Siboga-material, that "India" is much richer in species than DARWIN thought it was, and that coral-reefs are not so unfavourable to Cirripedes as formerly was supposed.

Before leaving this subject I may be permitted to repeat here what I said already in a provisional paper[1] regarding some results of the investigation of the Cirripedia collected during the voyage of the Siboga. To show that where the depth is more considerable, relatively large distances probably separate the places from each other where the animals of a certain species occur, or, that specimens of such a species are never numerous and not to be found at all at very many places, I pointed out that the "Siboga" brought back specimens of only two species of *Scalpellum* out of the ten that were collected by the "Challenger" in the Malay Archipelago[2]. That the "Siboga" brought back the only species of *Verruca* which the "Challenger" brought home from deeper water in that area, would, I said, not be in accordance with this observation — in both instances, however, the species was represented only by very few specimens. In this connexion I pointed out, that it was astonishing that in several cases, representatives of two and three species of *Scalpellum*, sometimes, moreover, accompanied by a single specimen of a species of *Verruca*, were obtained with the same haul of the dredge, from the very same locality in consequence. Such stations seemed to be very favourable to the occurrence of these animals; however, of the species found there the same holds good: viz., that they were always collected only in very few specimens. In a footnote I pointed out that the condition of the bottom must be considered of importance in this respect;

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[1] Read before the Amsterdam Royal Academy of Sciences at the Meeting of May 30, 1908.

[2] DARWIN (A Monograph of the fossil Lepadidae, 1851, p. 6) made the same observation with regard to the fossil species of *Scalpellum*, *Pollicipes*, etc.: he said "one would naturally have expected, that where circumstances favoured the existence of numerous species of a genus, they would likewise have favoured the multiplication of the individuals in all or most of such species; but this, as we here see, has not always been the case".

on the other hand that its importance was by no means so apparent for the distribution of the Cirripedia as might be expected, was shown by the fact that whilst many species of *Scalpellum* were found at places with a muddy bottom, several other species were obtained from a bottom of hard sand, of coarse sand, or of coral-sand, etc.

So far as our knowledge goes, we must consider most species of *Scalpellum* and *Verruca* as living solitary; as the number of species of these genera (and of *Scalpellum* especially) is very large, they may furnish valuable evidence for the theories about the influence of isolation on the origin of new species, which were brought forward originally by MORITZ WAGNER[1] and were criticised, and adopted, but only in a much modified form, by WEISMANN[2]. It is well-known that, whilst WAGNER defended the hypothesis that the formation of a new species took place only in consequence of migration and the isolation caused by it, WEISMANN tried to demonstrate that not only might a species, while remaining at the same locality, very well divide into two or more forms, but also that isolation did not necessarily lead to the development of varieties. So migration alone, even if it caused a complete isolation, was inadequate as the sole cause of mutation. On the other hand, WEISMANN agreed that isolation could be one of the factors causing the origin of new forms, in the first place, because the isolation prevented the crossing with individuals of the same species from the original habitat, and secondly, because it transferred the migrant and its descendants to new surroundings. From this point of view, looking at so many places at the bottom of the ocean, most of which present special conditions of life, depth, bottom, etc., and must indeed be considered as practically isolated from others, we are compelled to agree that circumstances there have been favourable to the developing of new forms. And then, we certainly cannot wonder that a genus like *Scalpellum*, which has survived from the Cretaceous period down to the present time, being represented in numerous secondary and tertiary deposits, and which as a recent genus is found living almost in all the seas and oceans of the world, has yielded excellent material for mutation and so for the development of new forms or species under the influence of isolation.

On the same occasion I pointed out that, with respect to the relation of the deep-sea forms to the extinct Cirripedes of which fossil remains have been preserved, the "Siboga" material fully confirmed the conclusions arrived at by the working up of the "Challenger"-Cirripedia. So I have not much to add to the views I have expressed already. I wish only to emphasize, that, so far as the evidence goes, the different genera show very remarkable differences with respect to that relation. It seems, as though we should consider this relation as belonging to the properties peculiar to each genus, although we are unable for the present to understand why the different genera differ so much in this respect. What I mean by these differences may be shown by the following comparison of some of the more important genera.

Genus *Pollicipes*, one of the oldest-known genera of the Lepadidae and of the Cirripedia in general, is represented in secondary and tertiary strata by numerous species. It still exists, but the number of recent species is small, 6 in all, and they occur only in warmer temperate and tropical seas, and are all coastal forms.

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[1] WAGNER, MORITZ, Die Darwin'sche Theorie und das Migrationsgesetz der Organismen. Leipzig, 1868.

[2] WEISMANN, AUG., Ueber den Einfluss der Isolirung auf die Artbildung. Leipzig, 1872.

Genus *Scalpellum*, almost as old as *Pollicipes*, but not quite, not being represented in the Lower Oolite; it is represented by numerous species, however, in secondary and tertiary strata. Number of recent species very large, at least 125 being at present known; distributed through all the seas and oceans of the world. Bathymetrical distribution a very wide one: the different species range from the coast down to the greatest depths inhabited by Cirripedes (± 5000 m.).

Genus *Verruca*. The oldest known species dates back to secondary times. A species that is still existing ranges from the Coralline Crag through different tertiary deposits. Number of recent species considerable, 36 being at present known. Found in all the seas of the world, being more numerous, however, in deeper water. Bathymetrical distribution a wide one, ranging from the coast down to 3400 m., not quite so wide, however, as was found for the genus *Scalpellum*.

Genus *Balanus*. The earlier species appeared during the deposition of the Eocene beds, no secondary species of this genus being known. Species very numerous in tertiary formations. Number of living species very considerable: more than 70 being at present known. Distribution all over the world's surface, numerous species inhabiting tidal rocks, coastal and shallow waters. Some go down into a more considerable depth, a few only are true deep-sea species. The greatest depth inhabited by a species of *Balanus* was found to be 564 m.

To close this introduction, the following list enumerates the Stations where species of Cirripedia were collected, indicating the place of the Station, its depth and the character of the bottom, and mentioning the name of the species that were collected. Places between the stations where Cirripedia were collected during shore-exploration are mentioned in the list.

Nr. of Station	Place of Station	Depth in meters	Bottom	Species collected at each Station
2	Madura Strait [1]	56	Grey mud	*Balanus amphitrite* Darw.
5	Near Java's East coast	330	Mud	*Scalpellum Stearnsi* Pilsbry var. *robusta* n. var.
12	S. of Kangeang Isl.	289	Mud and shells	*Poecilasma excavatum* n. sp.; *Balanus albus* n. sp.
16	Near Kangeang Isl.	22	Mud	*Chthamalus intertextus* Darw.
18	North of Bali	1018	Fine grey mud	*Scalpellum javanicum* n. sp.
19	West coast of Lombok	—	(Shore-exploration)	*Lepas anserifera* Linn.; *Ibla sibogae* n. sp.
19a	East coast of Lombok	—	(Shore-exploration)	*Lithotrya pacifica* Borrad.
19b	Bay of Pidjot, East coast of Lombok	—	(Shore-exploration)	*Chthamalus stellatus* Poli
38	Near Paternoster Isl.	521	Coral	*Poecilasma gracile* Hoek
45	North of Sumbawa	794	Fine grey mud	*Scalpellum polymorphum* n. sp.; *curiosum* n. sp.; *crinitum* n. sp.; *chitinosum* n. sp.; *Verruca cassis* n. sp.
46a	Near North coast of Sumbawa	1600	Mud	*Verruca cassis* n. sp.
47	Bay of Bima	55	Mud	*Dichelaspis Nierstraszi* n. sp.; *Scalpellum rostratum* Darw.; *Balanus bimae* n. sp.
	Bay of Bima	—	(Shore-exploration)	*Ibla sibogae* n. sp.

[1] The place of each Station is only roughly indicated. The exact position of the Stations is given with the descriptions of the species.

Nr. of Station	Place of Station	Depth in meters	Bottom	Species collected at each Station
47[b]	Entrance Bay of Bimae	296	Fine sand and mud	*Scalpellum uncus* n. sp.
49[a]	Sapeh Strait	69	Coral and shells	*Balanus maldivensis* Borrad.; *maculatus* n. sp.
50	Bay of Badjo	up to 40	Mud, sand, shells	*Balanus amphitrite* Darw.; *amaryllis* Darw.; *socialis* Hoek
	Bay of Badjo	—	(Shore-exploration)	*Ibla sibogae* n. sp.; *Pollicipes mitella* Linn.
51	Strait Molo	69—91	Fine grey sand	*Poecilasma eburneum* Hinds; *Balanus socialis* Hoek; *maldivensis* Borrad.
	Madura Bay	—	(Shore-exploration)	*Ibla Cumingi* Darwin; *Pollicipes mitella* Linn.
52	Between Flores and Sumba	959	Globigerina ooze	*Verruca navicula* n. sp.
53	Bay of Nangamessi (Sumba)	up to 36	Coral sand	*Microlepas diademae* n. gen. n. sp.
59	West entrance Samau Strait	390	Coarse coral-sand	*Balanus maldivensis* Borrad.; *Hexelasma velutinum* n. gen. n. sp.
60	Haingsisi, Samau Isl., Timor	23	Lithothamnium	*Dichelaspis Nierstraszi* n. sp.
	Haingsisi, Samau Isl., Timor	—	(Shore-exploration)	*Lithotrya truncata* (Quoy et Gaimard)
65[a]	South of Saleyer Isl.	120	Grey mud	*Dichelaspis Nierstraszi* n. sp.
71	Makassar and surroundings	up to 32	Mud and sand	*Dichelaspis Nierstraszi* n. sp.; *Balanus amphitrite* Darw.
71[a]	Lighthouse "de Bril" (Makassar)	Surface	On drift-wood	*Lepas anserifera* Linn.
71[b]	Pulu Barang (Makassar)	?	—	*Acasta conica* n. sp.
71[c]	Near Makassar	?	—	*Balanus amphitrite* Darw.
74	East of Makassar	450	Globigerina ooze	*Megalasma lineatum* n. sp.; *Scalpellum Stearnsi* Pilsbry var. *gemina* n. var.; *Verruca grex* n. sp.
77	Borneo-bank	59	Fine grey coral-sand	*Dichelaspis Nierstraszi* n. sp.; *orthogonia* Darw.
79	Borneo-bank	41—54	Fine coral-sand	*Poecilasma eburneum* Hinds
79[a]	Borneo-bank	54	Fine coral-sand	*Poecilasma eburneum* Hinds
80	Borneo-bank	40—50	Fine coral-sand	*Poecilasma eburneum* Hinds; *Dichelaspis Nierstraszi* n. sp.; *orthogonia* Darw.
86	Anchorage off Dongola	36	Fine grey mud	*Balanus longirostrum* n. sp.
	Dongola, Palos-Bay	—	(Reef-exploration)	*Ibla Cumingi* Darw.
87	Strait of Makassar	655	Fine grey mud	*Scalpellum proclive* n. sp.; *deforme* n. sp.
88	Strait of Makassar	1301	Fine grey mud	*Scalpellum distinctum* Hoek; *Verruca capsula* n. sp.; *nitida* Hoek
94	Sulu Sea	450	Sand and stone	*Scalpellum pellicatum* n. sp.
95	Sulu Sea	522	Stony bottom	*Balanus albus* n. sp.
97	Sulu Sea	564	Coarse coral-sand	*Balanus alatus* n. sp.
99	Anchorage off North-Ubian	16—23	Lithothamnium-bottom	*Dichelaspis Nierstraszi* n. sp.
105	North of Sulu Isl.	275	Coral-bottom	*Balanus tenuis* Hoek; *Hexelasma velutinum* n. gen. n. sp.
109	Sulu Archipelago	13	Lithothamnium-bottom	*Balanus amphitrite* Darw.
110	Celebes Sea	Surface	—	*Lepas anserifera* Linn.
115	Kwandang-Bay	Reef	—	*Ibla sibogae* n. sp.
10/VII '99	Keel of H. M. S. "Siboga"	—	—	*Lepas anserifera* Linn.
117	Kwandang-Bay-entrance	80	Sand and coral	*Balanus minutus* n. sp.
122	North of Menado (Celebes)	1264—1165	Stone	*Scalpellum acutum* Hoek
125	Anchorage off Sawan, Siau Isl.	27	Stone	*Dichelaspis Nierstraszi* n. sp.
131	Anchor. off Beo, Karakelang Isl.	—	(Reef-exploration)	*Tetraclita porosa* (Gmelin)
133	Anchor. off Lirung, Salibabu Isl.	up to 36	Mud, and hard sand	*Dichelaspis Nierstraszi* n. sp.
136	Ternate-anchorage	23	Mud, and stone	*Poecilasma fissum* Darw.; *Balanus auricoma* n. sp.
137	Between Makjan and Halmaheira	472	Muddy sand	*Scalpellum fissum* n. sp.
144	Anchorage North of Damar Isl.	45	Coral bottom	*Dichelaspis Nierstraszi* n. sp.; *Balanus navicula* Darw.
151	West of Waigeu Isl.	845	Grey mud	*Scalpellum acutum* Hoek; *Verruca cassis* n. sp.
152	North-West coast of Waigeu Isl.	—	(Reef-exploration)	*Tetraclita porosa* (Gmel.)
159	Halmaheira Sea	411	Coarse sand	*Scalpellum praeceps* n. sp.
161	Between Kofiau and Salawatti	798	Muddy sand	*Scalpellum incertum* n. sp.

Nr. of Station	Place of Station	Depth in meters	Bottom	Species collected at each Station
162	West coast of Salawatti	18	Sand with clay	*Balanus amphitrite* Darw.; *socialis* Hoek.
164	South of Salawatti	32	Sand	*Dichelaspis Nierstrassi* n. sp.; *Versluysi* n. sp.; *Balanus amphitrite* Darw.; *socialis* Hoek; *quadrivittatus* n. sp.; *quinquevittatus* n. sp.; *calceolus* Ellis; *cornutus* n. sp.
165	East coast of Misool	Surface	—	*Lepas anserifera* Linn.; *fascicularis* Ell. & Sol.
170	Between Ceram and New Guinea	924	Fine grey mud	*Verruca navicula* n. sp.; *casula* n. sp.
172	Near East point of Ceram.	18	Coral and Lithothamnium	*Dichelaspis Nierstrassi* n. sp.
175	Between Ceram and Misool	1914	Fine grey and green mud	*Scalpellum distinctum* Hoek.
177	Ceram Sea	1633	Dead coral and stones	*Poecilasma carinatum* Hoek.
204	Between Wowoni and Buton	75—94	Sand	*Scalpellum aries* n. sp.; *rostratum* Darw.; *Balanus compressus* n. sp.; *proripiens* n. sp.
205	Lohio Bay, Buton Strait	22	Sandy mud	*Balanus socialis* Hoek.
21/IX '99	Buton Strait	Surface	—	*Lepas anserifera* Linn.
208	South of Muna Isl.	1886	Solid green mud	*Scalpellum elegans* n. sp.; *distinctum* Hoek.
211	East of northern extremity of Saleyer Isl.	1158	Grey mud	*Scalpellum humile* n. sp.; *gracile* n. sp.; *acutum* Hoek.
212	West of Saleyer Isl.	462	Grey and green mud	*Scalpellum fissum* n. sp.
213	Saleyer anchorage	up to 36	Coral reefs, mud	*Dichelaspis Nierstrassi* n. sp.; *Tydemani* n. sp.; *Balanus socialis* Hoek; *Scalpellum rostratum* Darw.
15/X '99	Keel of H. M. S. "Siboga"	—	—	*Lepas anserifera* Linn.; *Balanus tintinnabulum* Linn. var.
214	Between Celebes and Flores	2796	Grey and green mud	*Scalpellum trapezoideum* n. sp.
	Between Celebes and Flores	Surface	—	*Lepas anserifera* Linn.
221	Banda Sea	2798	Bluish grey mud	*Scalpellum sculptum* n. sp.; *hexagonum* n. sp.; *discolor* n. sp.
(225)	Reef at Lucipara Isl.	—	—	*Tetraclita vitiata* Darw.; *porosa* (Gmel.)
(225°)	Reef at Lucipara Isl. South point	—	—	*Alepas lithotryae* n. sp.; *Lithotrya nicobarica* Rhdt.; *conica* n. sp.
227	Between Lucipara and Ambon	2081	Grey mud	*Scalpellum ciliatum* n. sp.; *formosum* n. sp.
(228)	S. of Ceram	Surface	—	*Lepas anserifera* Linn.
231	Ambon-Anchorage	40	Coral-sand	*Balanus hystrix* n. sp.
240	Banda-Anchorage	9—45	Black sand	*Balanus arcuatus* n. sp.
	Banda-Anchorage	—	(Reef-exploration)	*Tetraclita costata* Darw.; *coerulescens* Spengler.
241	Banda Sea, South of Ceram	1570	Dark sand	*Scalpellum sessile* n. sp.; *formosum* n. sp.
250	Anchorage off Kilsuin, Kur Isl.	—	(Reef-exploration)	*Lithotrya nicobarica* Rhdt.; *conica* n. sp.
251	South of Kur Isl.	204	Hard coral-sand	*Poecilasma dubium* n. sp.; *obliquum* n. sp.; *Megalasma striatum* Hoek; *Alepas tenuis* n. sp.; *Scalpellum imbricatum* n. sp.; *diota* n. sp.; *candidum* n. sp.; *Stearnsi* Pilsbry var. *robusta* n. var.; *Balanus pentacrini* n. sp.; *Pyrgoma Kuri* n. sp.; *Hexelasma velutinum* n. g. n. sp.
253	South of Taam Isl.	304	Grey clay	*Megalasma striatum* Hoek; *Poecilasma excavatum* n. sp.; *obliquum* n. sp.; *dubium* n. sp.; *Balanus pentacrini* n. sp.
254	Kei Isl. Archipelago	310	Fine grey mud	*Scalpellum Stearnsi* Pilsbry var. *robusta* n. var.; *Verruca conchula* n. sp. var. *minor* n. var.
256	Kei Isl. Archipelago	397	Greyish green mud	*Scalpellum hamulus* n. sp.; *polymorphum* n. sp.; *pellicatum* n. sp.
257	Kei Isl. Archipelago	till 52	Coral	*Dichelaspis Nierstrassi* n. sp.; *Creusia spinulosa* Leach var. (11); *Balanus terebratus* Darw.
258	Tual-anchorage, Kei Isl.	22	Sand and coral	*Dichelaspis Nierstrassi* n. sp.; *Versluysi* var. n. var.; *Balanus amaryllis* Darw.
260	Near Kei Isl.	90	Sand, coral, and shells	*Alepas intermedia* n. sp.; *Balanus albus* n. sp. ? *auricoma* n. sp.; *investitus* n. sp.

Nr. of Station	Place of Station	Depth in meters	Bottom	Species collected at each Station
262	Kei Isl. Archipelago	560	Bluish grey mud	*Dichelaspis Weberi* n. sp.; *Verruca capsula* n. sp.; *Hexelasma arafurae* n. g. n. sp.
267	East of Kei Isl.	984	Grey mud	*Alepas ovalis* n. sp.; *Verruca grex* n. sp.; *Megalasma striatum* Hoek.
271	West of Aru Isl.	1788	Bluish green mud	*Scalpellum inflatum* n. sp.; *moluccanum* Hoek; *chitinosum* n. sp.
273	Anchorage off Pulu Jedan	13	Sand and shells	*Balanus amphitrite* Darw.; *amaryllis* Darw.
	Anchorage off Pulu Jedan	—	(Shore-exploration)	*Scalpellum Peroni* (Gray); *Pyrgoma jedani* n. sp.
274	Near Jedan Isl.	57	Sand, shells, stones	*Dichelaspis Nierstraszi* n. sp.; *Scalpellum pollicipedoides* n. sp.
282	Anchorage between Nusa Besi and North-East of Timor	27—54	Sand, coral, Lithothamnium	*Dichelaspis Nierstraszi* n. sp.
284	South of East point of Timor	828	Grey mud	*Poecilasma carinatum* Hoek; *Verruca cassis* n. sp.
285	Anchorage South coast of Timor	34	Limit between mud and coral-sand	*Scalpellum uncus* n. sp.
289	South coast of (Portug.) Timor	112	Mud, sand, shells	*Dichelaspis Nierstraszi* n. sp.; *orthogonia* Darw.; *Balanus compressus* n. sp.
294	South coast of (Dutch) Timor	73	Soft mud with sand	*Dichelaspis orthogonia* Darw. (?); *Scalpellum rostratum* Darw.
295	South of Batu Patih (Timor)	2050	Fine grey mud	*Scalpellum virgatum* n. sp.; *ventricosum* n. sp.
297	East of Rotti Isl.	520	Soft grey mud	*Verruca capsula* n. sp.; *grex* n. sp.; *conchula* n. sp.
299	Boeka- or Cyrus-bay South coast of Rotti Isl.	34	Mud, coral, Lithothamnium	*Balanus quadrivittatus* Darw.
300	Near East coast of Rotti Isl.	918	Fine grey mud	*Scalpellum poculum* n. sp.
301	Pepela-bay, East coast of Rotti Isl.	22	Mud, coral, Lithothamnium	*Acasta glans* Lamarck
302	Between Timor and Rotti Isl.	216	Sand and coral-sand	*Balanus maldivensis* Borrad.
305	Between Adonara and Solor	113	Stony	*Balanus ciliatus* n. sp.
310	East coast of Sumbawa	73	Sand with dead coral	*Balanus maculatus* n. sp.; *maldivensis* Borrad.; *investitus* n. sp.
311	Sapeh-bay, East coast of Sumbawa	—	(Shore- and reef-exploration)	*Chthamalus stellatus* Poli
313	Anchorage East of Dangar Besar, Saleh-bay	up to 36	Sand, coral, mud	*Balanus longirostrum* n. sp.; *Creusia spinulosa* Leach var. *Sumbawae* n. var.
315	Anchorage East of Sailus Besar, Paternoster Isl.	up to 36	Coral and Lithothamnium	*Dichelaspis Nierstraszi* n. sp.
316	Bali Sea, North of Lombok	538	Fine dark mud	*Alepas morula* n. sp.
318	Java Sea, North-West of Kangeang Isl.	88	Fine grey mud	*Dichelaspis orthogonia* Darw. (forma dubia)

Haarlem, October 1912

DIE RHIZOCEPHALEN DER SIBOGA-EXPEDITION